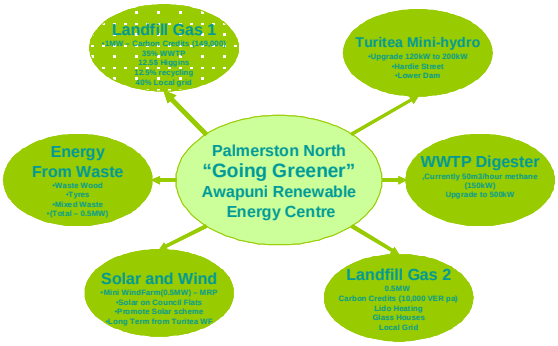
Palmerston North City Council
Biogas to Energy Project

Phil Burt – Palmerston North City Council

Part of "Sustainability" Strategy

- Over-arching strategy
- Long term
- Linked to sustainability goals
- Specific targets
- Over-arching brand

Going Greener



Renewable Energy Target

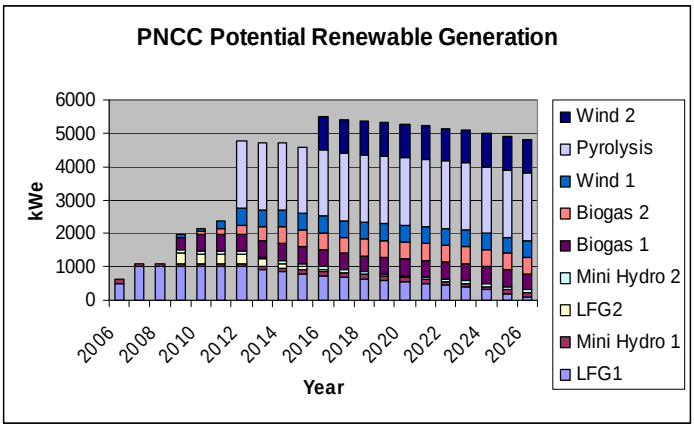
- Council has target to generate 100% of electricity needs (2.5MW) by 2012.
- Target generation is:
  - Landfill gas
  - Biomass
  - (Mini) Hydro
  - Wind
- There is existing 1MW LFG and 140kW Mini-hydro
- Biogas will replace LFG as it is depleted in next 15 to 20 years

Generate Power

- The methane from Landfill gas and biogas can be used to generate electricity and heat.
- The syngas from pyrolysis and gasification can also be used to generate electricity and heat.
- Electricity can be used locally or sent to the grid.
- A local use of heat is a bonus.

New Biogas Generator

The long term generation plan is shown in the graph below:



Progress to Date

- The LFG 1 project has been fully implemented
- The Turitea mini hydro upgrade has been designed and is out for tender.
- The LFG 2 and Anaerobic Digester upgrade has been combined into this mixed gas CHP project.

Existing renewable Generation

LFG1 – Awapuni Landfill Gas to Electricity Project

The Awapuni Landfill Gas to Electricity Project was awarded 149,006 ERU's (Emission Reduction Units) from the New Zealand Government in the 2003 Projects to Reduce Emissions (PRE) Programme for the 2008 to 2012 (first Kyoto commitment period).

Selecting the Engine

- The evaluation involved a formal RFP process.
- Shortlisted 3 suppliers
- Involved reference checks and site visits to evaluate their technology.
- Evaluation considered a number of factors including
- Technical capacity
- Track record
- Management & financial
- Cost (Capex and Opex)

Engine Selection (cont)

Two options were assessed

- Council purchases the 2nd CHP plant or;
- Council enters a partnership type arrangement
- Based on PNCC supplies sufficient gas
- Generator operator owns & maintains unit, sells electricity & heat to PNCC (at discount)
- Share of cash flows (and costs) from additional carbon credits & energy sales

Financial Modelling

- Extensive financial modelling was undertaken with the assistance of PWC
- Modelled five different scenarios featuring supplementary gas supplies (natural gas), differing generator sizes and ownership options
- The final result was that ownership of a 750kWe generator resulted in the most financially favourable outcome for PNCC

NPV/IRR modeling of cash flows showing the estimated 20 year return

Option	8.5 cents/kWhr	9.0 cents/kWhr	9.5 cents/kWhr	10.5 cents/kWhr
750kWe without Carbon Credits – 3% Electricity Inflation	9.5%	11.3%	13.0%	16.3%
750kWe without Carbon Credits – 4% Electricity Inflation	11.5%			18.1%
750kWe with Carbon Credits – 3% Electricity Inflation	13.1%		16.8%	
750kWe with Carbon Credits – 4% Electricity Inflation	15.1%			21.9%

Awapuni Regional Biomass to Energy Project

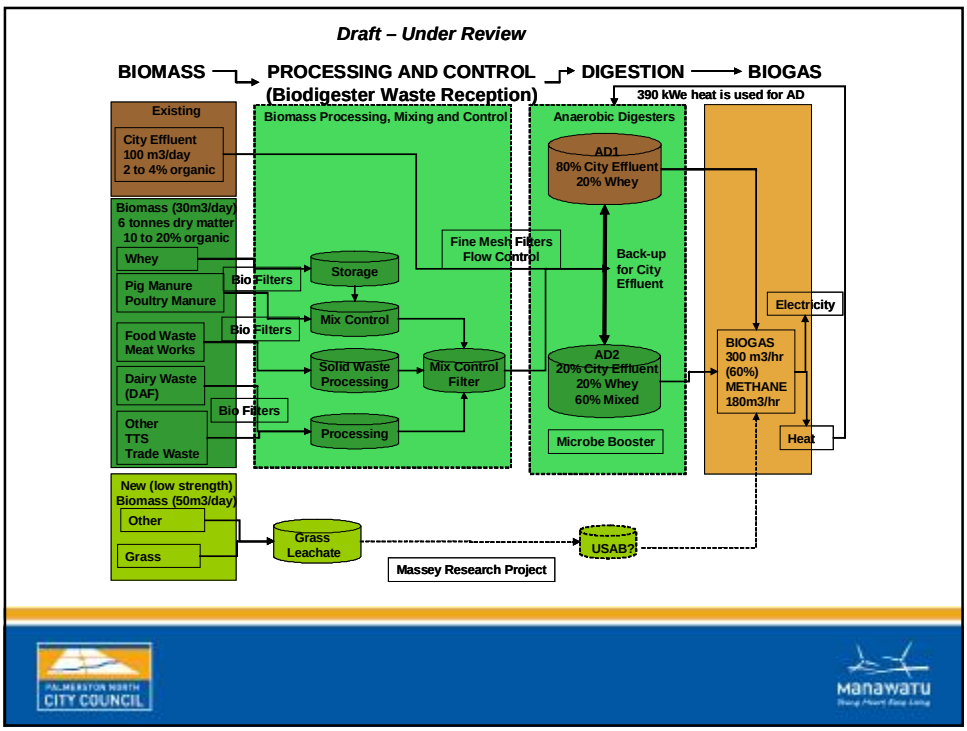
- Regional
- Based on existing Anaerobic Digesters which are being modified
- Use mixed sources of biomass
- Possibly part funded by carbon finance

Biogas Production - Anaerobic Digestion

- In Anaerobic digestion the organic material is converted to biogas by microbial activity
- Makes use of an existing Asset
- Move from 2 to 1 tank for City effluent
- Existing facility is upgraded with improved mixing and efficiency
- Target to generate 180 m3/hr methane from 2 tanks within 3 years. The biogas has around 60% methane

Increasing Biogas Production

- Started in 2006 with the Environmental Engineering Department at Massey, involved trials using whey from local dairy factory, only partially successful.
- CPG then called Waste Solutions were engaged to assess the current performance of the AD's.
- Initial work suggested the baseline biogas potential could be increased to 500kWe from existing feed stocks.
- With additional feed stocks biogas production could be increased to supply up to 750Kw of electrical production.

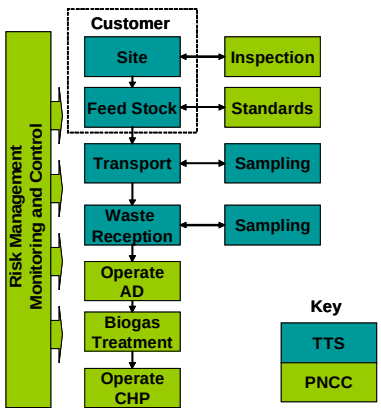


Includes Improvements to mixing

New External Mixing System on Digester 2

Liquid Organic Processing and Control

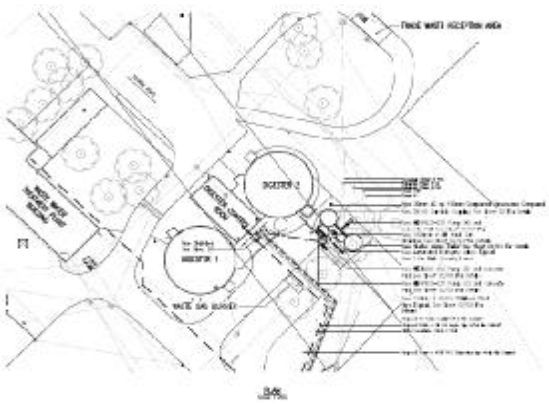
- TTS manages the liquid organic waste reception for the Council.
  - 8 Sampling
  - 8 Mixing
  - 8 Storage
- The AD and CHP facilities are managed by the Council.
- Risk Management is a joint responsibility starting out with a comprehensive risk assessment of each site/source.



Partnership with Transpacific Technical Services

- Transpacific Technical Services (TTS) is a long term partner in the collection of the liquid organic material.
- TTS also manages the customer contract.
- Because of the economies of scale there are some instances where it is cost effective to bring in liquid organic waste from outside the region.

New Sludge Reception

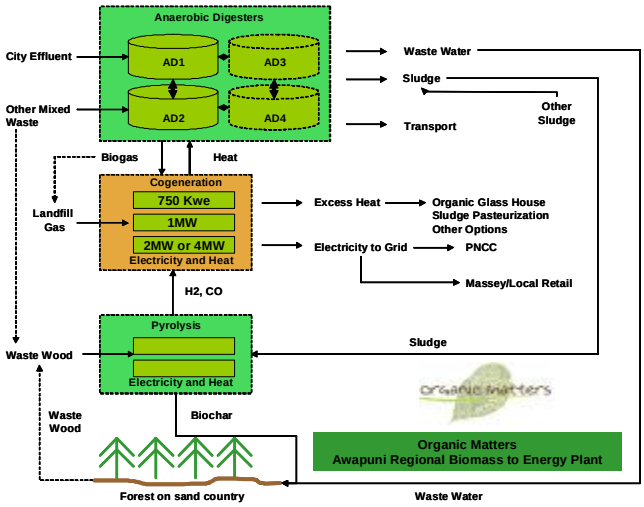


- Consisting of two 30000L tanks
- Proprietary mixing system supplied by PumpSystems of Christchurch (Rotamix System)

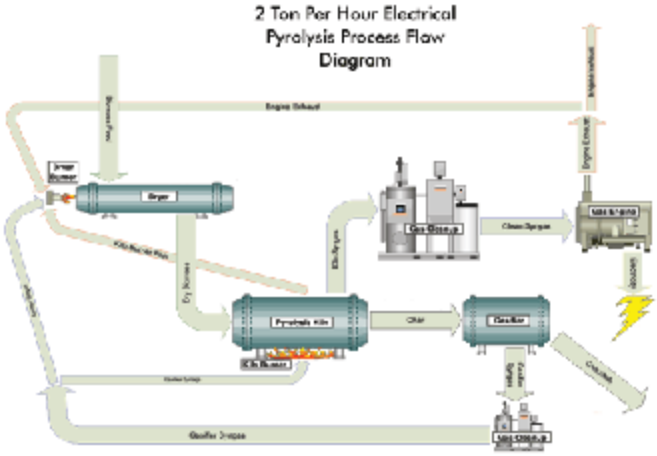
Organic Waste to Energy Options

- WtE or EfW
- Can be MSW or specific such as organics
- Thermal verses Non-thermal
- With or without oxygen
- Some relevant WtE technologies are:
  - 8 Anaerobic Digestion
  - 8 Gasification
  - 8 Pyrolysis

Next Steps in integrated organics utilisation



(Slow) Pyrolysis



Final Words

- Organic waste is a resource
- Many areas of New Zealand have a consistent and abundant supply
- Utilisation needs to take into account local and regional needs for soil, farming and energy generation
- A regional focus will result in better economies of scale
- A long term collaborative model using a PPP could be appropriate
- A diversion of organic material from land disposal, water disposal, landfill etc is beneficial to the wider community and environment
- This project could be part funded by sale of Swiss Gold Standard Carbon Credits
- The project team (PNCC, CMS and TBL) have experience in obtaining and marketing of carbon credits.