

**Bioenergy -  
providing NZ with  
energy security  
and economic  
wealth**

# A snapshot of the sector today

- 9% of consumer energy comes from biomass and organic waste
- Potential is 27% if liquid biofuels included.
- Solid biofuels
  - Well established biomass supply chain
  - Proven off the shelf technology
  - Driven by ban on coal
  - Wood Industries Transformation Plan aims at ensuring adequate biomass
- Gaseous biofuels
  - Driven by aim to reduce food waste going to landfill
  - Emerging market
  - Proven technology
  - Driven by circular economic approach
  - Driven by demand for renewable gases
- Liquid biofuels
  - Little market interest except Air NZ SAF projects



# A strong foundation of information for growth

- Bioenergy Knowledge Centre
- Websites
  - [www.biogas.org.nz](http://www.biogas.org.nz)
  - [www.usewoodfuel.org.nz](http://www.usewoodfuel.org.nz)
  - [www.liquidbiofuels.org.nz](http://www.liquidbiofuels.org.nz)
- Gaseous biofuels
  - Gas supply and demand study – Gas Industry Company
  - Gas Transition Plan - Biogas Research Report – BECA
  - Exploring short-term renewable LPG/DME production for NZ – Worley
  - Food waste – Prime Minister’s Science Adviser
- Solid Biofuels
  - Forestry and Wood Processing Industry Transformation Plan – Te Uru Rakau
  - Wood Fibre Futures – Te Uru Rakau
  - Regional Energy Transition Accelerator reports - EECA

# The industry participants

- Gaseous biofuels
  - Municipal councils
  - Food processors
  - Farmers
  - Gas retailers
- Solid biofuels
  - Heat plant owners
  - Accredited Wood Fuel Suppliers
  - Registered Advisers
  - Forestry and wood processors
  - Farmers
- Liquid biofuels
  - Air NZ
  - Coastal marine

**Requires collaborative action**



# Gaseous biofuels demand in 2050

	Application areas	Energy from bioenergy or biofuels (PJ)	
<b>Gaseous biofuels</b>			
	Electricity smoothing	3	
	Heat users (Circular own use)	5	
	Transport	1	
	Biomethanol	10	
	rLPG	9	
	Biomethane to gas network	32	
			60

# Sources of organic material

			2050
			Energy PJ
<b>Organic</b>			
Waste			
	Municipal WWTP		0.6
	Gas capture at landfill		3
	Dairy effluents		6.8
	Post consumer organics		1.5
Residues			
	Crop residues		1.4
	Pulp and paper effluent		0.6
	Pig and poultry organics		1.7
	Food processing residues		1.8
Non residual sources			
	Break and supplementary crops		42.6
			60.0

# Solid biofuels demand in 2050

	Application areas	Energy from bioenergy or biofuels (PJ)	
<b>Solid biofuels</b>			
	Residential/commercial	3	
	Wood processing (existing)	35	
	Stationary heat (fuel switching)	10	
	Electricity firming	8	
			56

# Liquid biofuels demand in 2050

	Application areas	Energy from bioenergy or biofuels (PJ)	
<b>Liquid biofuels</b>			
	Domestic aviation <sup>5</sup>	4	
	Domestic marine <sup>6</sup>	2	
	International aviation <sup>7</sup>	6	
	International marine <sup>8</sup>	6	
	Heavy land transport <sup>9</sup>	6	
	Rail <sup>10</sup>	1	
	Off road land transport <sup>11</sup>	10	
	Stationary heat (fuel switching) <sup>12</sup>	1	
			36



# Sources of Biomass

			2050	
			Energy PJ	Quantity
<b>Biomass</b>				
	Municipal			
		Municipal wood wastes	2.4	266,000 tpa
		Arborist	0	158,000 tpa
	Agriculture and horticulture			
		Horticulture	0.9	126,000 tpa
		Agriculture crop residues	6.2	351,000 tpa
		Shelterbelt	0.6	82,000 m <sup>3</sup> pa
		New farm forestry	16.9	
	Non residual sources			
		Sawmill chip	11.6	1,688,000 tpa
		Diversion from export K grade logs	31.4	4,546,000 tpa
		Douglas Fir production thinnings	0.9	
		Energy crops	0	
			70.9	

# Sources of biomass

		2050	
		Energy PJ	Quantity
<b>Biomass</b>			
	Wood processing		
	Existing wood processing	43	
	Port bark	1.8	262,000 tpa
	Pulp log	5.6	817,000 m <sup>3</sup> pa
	New wood processing residues	13.1	
	Forestry		
	Harvested carbon forest	2	
	Production thinnings	1.6	232,000 m <sup>3</sup> pa
	Waste thinnings	3.6	192,000 odt pa
	Pruning residues	0.5	25,000 odt pa
	Inforest landing residues	11.3	1,643,000 m <sup>3</sup> pa
	Cutover - ground based	8	1,164,000 m <sup>3</sup> pa
	Cutover - hauler/cable	1	145,000 m <sup>3</sup> pa
	Wilding forest	0.2	
	New plantation forestry residues	10	
		101.7	

# Energy solutions

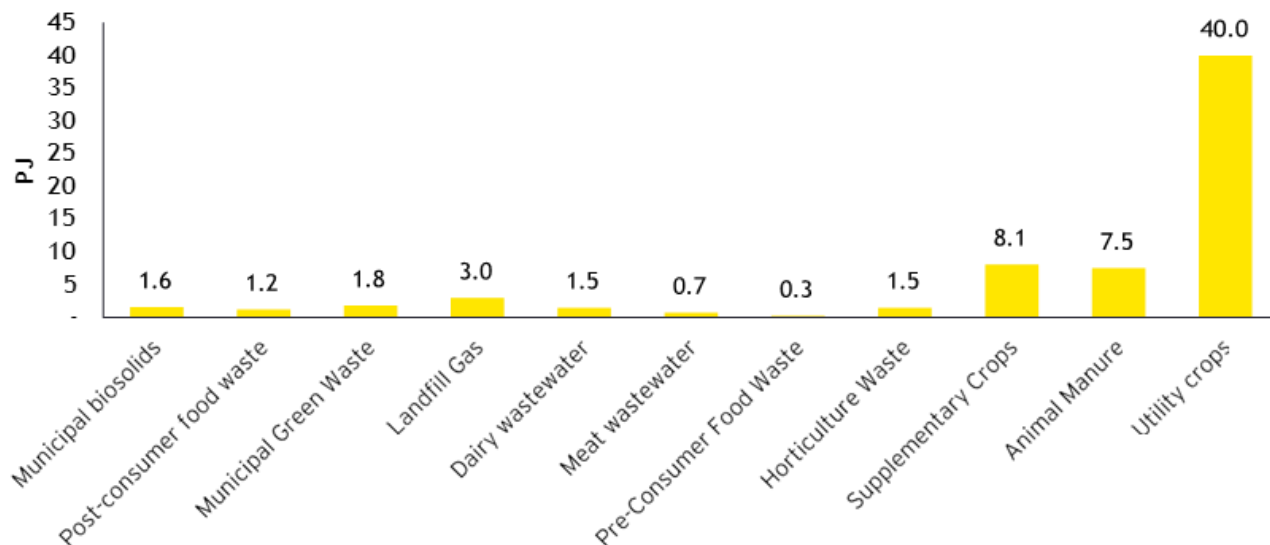
# Ensuring food processors have the most appropriate energy supply for heat generation.

- Owners of coal boilers indicate a preference to use biomass rather than electricity , if the biofuel is available.
- Bioenergy can provides hedging against higher energy costs in the future
  - Biogas can be produced from own organic residues
  - Solid biofuel can be sourced locally
  - Not dependent on consenting and construction of new power stations
- Bioenergy can strengthen resilience of the business
  - Direct management of energy supply
  - Can have direct contracts with the biomass suppliers
  - Spreads the energy supply risk and not dependent on national infrastructure

# Replacing up to 100% of essential fossil gases with biogases by 2050, including imported LPG.

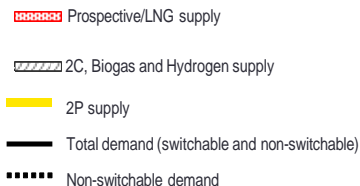
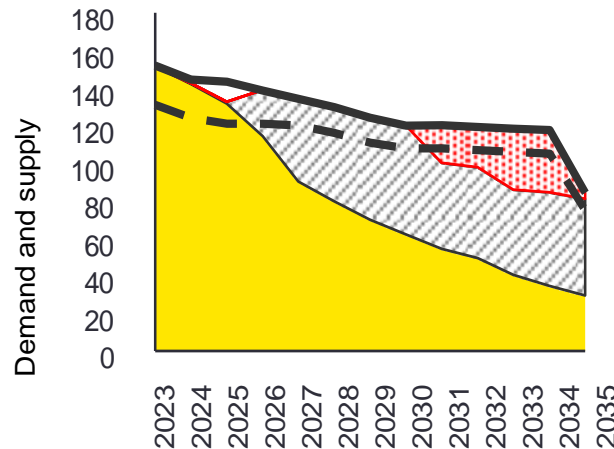
- Current gas demand is 160PJ
- Essential gas demand assessed as 60PJ
  - Is achievable but requires collective action
- Current biogas supply is 4.9PJ

Potential biogas supply by category



# Gas sector wants biomethane

- Gas sector planning includes significant demand for gaseous biofuels



- Gas is an important part of the energy supply mix
- Lack of interest in new offshore gas exploration
- Risk of stranded assets
- Ideally want a drop-in renewable gas
- Replacement gas for manufacturing

Provide biomethane as a biofuel for gas turbine generators (Green Peakers) to smooth electricity supply fluctuations.

- Gas turbine are fast response suitable for electricity smoothing
- Increases the amount of wind and solar that can be built and operated
- Gas turbines are already built and operating
  - No capital expenditure to provide smoothing
- Underground gas storage already available – Ahuroa
- Trading of biomethane will require establishment of a Renewable Gas Certification Scheme.

# Refueling Huntly Power Station on biomass fuel

- Guarantees a low carbon firming capacity for dry hydro years
- Avoids shutting Huntly down and having to replace it with a multi-million-dollar alternative such as Lake Onslow project.
- Establishes a cornerstone market for use of forest residues to manufacture black pellet fuel
- Black pellet fuel is a potential drop-in fuel for large coal boilers eg Fonterra
- There is a high demand for export of black pellets to similar PF boilers in SE Asia



# Provides security of energy supply

- Biofuels can assist electricity to be used in the right application
- Improve energy security by having a diversity of energy forms
- Increased regional supply from bioenergy as a distributed energy source
- Reducing an over dependence on the need to build additional electricity power stations and distribution infrastructure

Improves sustainable land use

# Biofuel production provides another income stream for landowners.

- Farms are expanding diversity by producing new products
- Forest or cropping residues provide another income stream for landowners.
- Underpin sustainable food production and processing .
- Bioenergy from residues allows food processors to hedge future energy costs by directly managing their own energy supply for heat.

## Improve management of agricultural land by integrating trees into farming landscapes,

- Trees can lower impact of erosion, sedimentation, and nutrient losses
- 6-9% of a farm is not highly productively used
- Cropping requires break crops to maintain soil health
- Sequestration can be an offset to animal emissions.
- Forest slash as biofuel provides a market for a damaging waste product.
- Farm Environmental Plans should include contributions from trees and use of residues

# Ensuring that there is adequate biomass available

- Availability needs to be for the next 30 years
- Integrating trees on farms  $\Rightarrow$  ~25% of biomass supply
- We have adequate class 7 land for plantation forestry
- Increased added value processing of wood produces greater volumes of residues
- Getting value for farm crop residues
- Implementation of ITP



# Sustainable food production

# Meeting international food buyers requirements

- Farmers and horticulturists want to improve New Zealand's credentials as a sustainable food supplier to the world.
- There are many technologies or practices which already exist but until now have not had strong drivers for adoption.
- Utilisation of biogas sources helps ensure NZ food producers and suppliers can promise international food buyers a lower carbon footprint throughout their supply chain.
- Two primary drivers are
  - reducing production and processing costs and
  - demonstrating sustainability, including offsetting of animal greenhouse gas emissions.

# Increase food production.

- Farm crop residues can be recycled to produce biogas, food grade carbon dioxide, and biofertilizer.
- Integrating trees into farming landscapes improve management of agricultural land and increases productivity
  - lowering impact of erosion, sedimentation, and nutrient losses
  - Shelter improves animal health
  - Earn carbon credits.
- Arable break crops are important for
  - maintaining soil health
  - Diversification of crops and thus markets
  - a source of feedstock for the production of energy
  - providing an additional revenue stream for farmers.



# Linear to circular food production

- Business and communities are moving from linear to circular approach to use of resources
- Recycling of residues into new products
- Recycling organics to produce energy
  - Reduce need to purchase energy
  - Can have control over energy security
- Improves demonstration of sustainability

# Greenhouse gas and environmental impacts

# Reducing environmental impacts

- Selective logging of managed riparian plantings
- Use managed woodlots to absorb nutrients
- Removal of residues avoids Tairawhiti type situation
- Biofertiliser avoids the use of imported fertilisers
- Trees a good erosion avoidance tool
- Collecting and processing forest slash into biofuel can deliver significant regional benefits

# Lower emissions with biofuel use will help contribute to NZ meeting its Paris Accord targets

- Assist the Government avoid the need to purchase an estimated \$24billion of international emissions reduction credits.
- Commercial driven investment will result in GHG emissions reduction as being free
- Farm residues can be used to create biofertilisers, replacing the importation of non-organic, higher emitting fertilisers.

# Improve value from land use

- Provide an additional revenue stream for forest owners and wood processors from the residues which are often wasted or exported as low value logs.
- Provide an avenue for converting slash into high value energy products and thus avoiding the situation we have recently experienced in Tairāwhiti where there was no demand for forest residues. Extraction and use of the residues to produce bioenergy and biofuels would have limited the catastrophic consequences.
- Improve agriculture land management by integration of trees on farms to stop erosion, provide farmers with an additional revenue stream from selling biomass, and improve animal welfare.
- The wood residue recovery systems being developed for energy production are able to be used for the sourcing of feedstock for future manufacture of other bio-products.
- Bioenergy and biofuels has been assessed as being a \$6billion industry with the value of greenhouse gas emission reduction on top of that.

# The role of Government

# What Government can do to assist.

- Unlike solar and wind, bioenergy has a complex matrix of participants.
- The public benefits are often greater than private investor benefits.
- The biomass and organic residues are not homogenous and sources change
- Support transition from fossil to renewable gases with renewable gas certification.
- Support business transition similar to GIDI
- Support municipal authorities to recycle liquid/solid waste streams for energy and fertiliser production

# Develop a comprehensive Energy Strategy

- Must include all energy types, sources, and applications
- Must address all sources of energy
  - Geothermal
  - Oil and gas
  - Biomass and organic wastes
  - Wind and solar
  - Hydro
- Energy storage and distribution
- Resource locations including future sources



# Implement the Waste Strategy

- The Waste Strategy needs an accompanying Action Plan
- Encourage municipal authorities to recycle liquid/solid waste streams for energy and fertiliser production.
- A policy of zero organic waste to landfill and larger levy would incentivize recycling

# Support the Forestry and Wood Processing Industry Transformation Plan-

- The ITP is supported by all sector participant groups
- The sector is driving priorities for implementation
- Implementation will ensure residues for bioenergy are efficiently obtained at least cost for long term secure energy production
- The sector levy contributes funding

# Investigate liquid biofuels – as a “drop in” fuel for heavy land, air, rail, and marine transport,

- A drop-in biofuel for heavy transport would allow owners to avoid unnecessary capital expenditure
- There has been very limited interest in development of liquid biofuel opportunities
- Air NZ has been exploring options for production of SAF in NZ
- Marine and rail are obvious markets for renewable diesel.
- Bioenergy Association is a member of the Sustainable Aviation Fuel Alliance of Australia and New Zealand