Biofuels in New Zealand

Who's Who in NZ Biofuels

New Zealand has a fledgling biofuels industry with considerable potential. Bioethanol and biodiesel are produced and available for wholesale purchase and blended bioethanol petrol is available for retail sales at two outlets. Some brief details of the key leading players in the sector are listed below. These companies are currently producing biodiesel or bioethanol. Individuals or Organisations who are at the research / trial stage are listed under Biofuels Research in New Zealand below.

Current Status in the New Zealand Industry

The following articles summarise the situation in New Zealand at present with respect to liquid biofuels:

- "***Baa-baa black gold - In search of the BETTER OIL***", ***bright*** (the New Zealand Trade and Enterprise publication), (March/April 2007).
- **Ethanol**, **e.nz magazine**, (January/February 2009).

Key players in NZ Liquid Biofuels – Fuel Producers and Wholesalers

- **BioDiesel Oils (NZ)**. East Tāmaki, Auckland, biodiesel from **tallow**.
- **Ecodiesel Ltd** , South Auckland, biodiesel from **tallow**.
- **Biodiesel New Zealand**, Christchurch, **used cooking oil** and **rapeseed oil** grown as a rotational crop with other food crops.
- **Anchor Ethanol** - Auckland, bioethanol from **whey**.
- **NZ Ester Fuels** - Pukekohe, Auckland, biodiesel from **used cooking oil**, **tallow**, and materials rich in free fatty acids (FFA).
- **Flo-Dry Engineering** - Auckland, biodiesel from **Tallow** (via reactive distillation).
- **Environfuels** - Te Kuiti, Waikato, biodiesel from used vegetable oil (and expanding to utilise seed oil grown on marginal land).
- **Kiwifuels** - Rangiora, biodiesel from **rapeseed oil** (otherwise known as canola)
- **Envirocar** – Auckland, vehicle conversion system supported with biofuels ('Environfuel') from recycled and recovered cooking oil. Environfuel is ready for use post modification of the vehicle. Environfuel is only available to those who have purchased the Envirocar biofuel conversion system.

Key players in NZ Liquid Biofuels – Fuel Retailers

- **Gull** – North Island. Gull was the first to bring a biofuel to market in New Zealand with Gull Force 10. Also available is Gull Regular Plus. More details **here**.
- **Mobil** – Wellington Region Trial, Mobil sells ethanol-blended petrol E3 and E10 blends. More details **here**. E10 – contains up to 10% ethanol blended with Premium grade petrol. E3 – contains up to 3% ethanol blended with Regular grade petrol.

Key players in NZ Liquid Biofuels – Consultants

- **AECOM** – Energy and Engineering advisory services.
- **Waste Solutions** – Consultancy in wastewater and innovative biotechnology solutions for producing energy and value added products from waste.

Key players in NZ Liquid Biofuels – Equipment Providers/Design Engineers

- **Flo-Dry Engineering** - Auckland, Engineers who design and build waste treatment plants for food processing industries to efficiently extract products from animal waste which is recoverable as **tallow** or nutritional stock feed, fertiliser or bone gelatine.

Overview of Liquid Biofuels in New Zealand

"Innovation Knowledge and Skills in New Zealand Liquid Biofuels" - click **here** to download

Summary Table of Key Players in New Zealand Biofuels Market

The following summary table provides some key details of the leading players in the Liquid Biofuels Sector in New Zealand.

The following details are available for each of the key players listed:

- Company Name and Contact Details
- Core Skill(s)
- Biofuel Focus
- Core Product/Activity
- Key Project Activities
- Leading Edge
- Investment Base
- Employees
- Production Capacity

Company name / contact	Core Skill	Core product/activity	Leading edge
AES **Company Profile** Contact: Gavin Hedley Ph: +64 (0) 9 238 0683 Mobile: +64 21 740 490 **Email**	*Technical Skills and marketing of Pyrolysis. * Bioenergy technologies for forest and other residues recovery and utilisation.	* Ankur Gasification representation - 10Kw to 2.2Mw Electricial generation - 30Kw to 5.6Mw Heat Energy. * ABRItech Bio oil/ bio char systems - 1-100 TPD	AES has *working* demonstration technology for bio-oil in New Zealand. We can practically demonstrate, using your feed stock, the manufacture both of bio-oil and biochar in an actual, commercially scaled plant.
Ag Research **Company Profile** **Website** Contact: Heather Went Ph: +64 (0) 6 351 8035	*Recombinant protein expression. * Enzyme characterisation and enhancement. *Plant technology and product development	* Cost-effective, scalable, biofuel enzyme production	AgResearch's biofuel enzyme manufacture technology will be compatible with the full range of lignocellulosic feedstocks coupled with algal, yeast or bacteria-based biorefinery processes. Using plants to produce enzymes will be more cost effective, require minimal capital investment and be rapidly scalable in response to demand compared to building new, high-cost infrastructure for fermentation-based enzyme manufacture.
Anchor Ethanol (Fonterra) **Company Profile** **Website** Contact: Peter	* Fermentation Technology *Distillation Technology *Marketing	* Ethanol from Dairy Whey	Whey fermentation - an opportunity to further process a waste material into ethanol.

Motion Ph: +64 (0) 9 374 9000			
Aquaflow Bionomic Corporation **Company Profile** **Website** Contact: Paul Dorrington Ph: +64 (0) 3 543 8227	* Wild Algae harvesting technology * Pond water quality remediation * Processing plant design * Green Crude processing technology * High value chemicals	* Remediated water *Partnered Biodiesel from Algae Biomass	Aquaflow provides a low cost method of wild algae biomass extraction from existing waste water facilities. The algae extraction process improves the waste water quality by significantly reducing nitrogen and phosphorous loadings, BOD and coliform levels. The biomass can then be used in agricultural/ aquaculture applications, cogeneration/methanol fuel, or biofuels feedstock production.
Biodiesel New Zealand **Company Profile** **Website** Contact: Andrew Simcock Ph: +64 21 667 199	* Used oil collection * Agronomy and agricultural activities supporting oil seed rape ()SR) * Production technology and design * Logistics and operational support * Sales & Market Development	* Bio Diesel, oil seed rape, used cooking oil and related products and markets	Biodiesel New Zealand has been making and selling high quality biodiesel derived from used vegetable oil (UCO) for over three years. More recently, we have been growing oilseed rape (OSR) for biodiesel production. We are the leading supplier of biodiesel in NZ having a multiple feedstock, fully integrated, market-led strategy to increasingly supply the NZ diesel market with quality biodiesel promoting benefits and scale relevant to today's key markets.

Carbonscape **Company Profile** **Website** Contact: Forrest Tyrrell-Baxter Ph: +64 (0) 3 579 2274	* New Process Development * Clean Technology Commercialisation * Emerging carbon emissions reduction GHG, CDM markets * Industrial Micro-wave Systems	* Biochar, Bio oil, Syngas, Activated Charcoal	Carbonscape's state of the art process has advantages over traditional pyrolysis methods by rapidly producing high grade charcoal efficiently and economically. The process also produces valuable byproducts of bio oil fuel and syngas, which can be combusted to release industrial heat or electricity energy.
Cawthorn Institute **Company Profile** **Website** Contact: Mike Packer Ph: +64 3 548 2319	*Algal Production Technology * Algal Strain Identification * Waste to Fuel generation	* Biocrude from integrated CO2 capture	Selection and husbandry of micro algae for fuel generation and CO2 Capture.
GNS Science **Company Profile** **Website** Contact: Matthew Stott Ph: +64 (0) 7 374 8211	* Enrichment and isolation of novel extremophilic bacteria with current focus on cellulolytic thermophiles	* Fundamental research into thermophilic bacterial cellulolytics	The Geomicro-biology group targets and isolates novel bacterial isolates from NZ's unique geothermal systems. Because of our location and pre-existing legal agreement with landowners for the biodiscovery and application of novel micro-organisms, we are able to easily refine enrichments while providing the security.
Haarslev Industries Company Profile	* Research & Development * Basic Design &	Rendering Plant Packages * Waste Water Plant	In-house developed continuous **Reactive Distillation Process** based

Website Contact: Malcolm Mendis Ph: +64 (0) 9 415 2330	Detailed Engineering * Plant Design * Plant Construction / Maintenance / Operation	Packages * Biodiesel Plant Packages * FEDW Plant Packages	Biodiesel plant capable of converting most difficult feedstocks at a competitive economic conversion cost.
IPL/Biofuel Testing NZ **Company Profile** **Website** Contact: Ivor Reyes Ph: +64 (0) 9 432 7744	* Biofuel analysis and testing to regulatory limits * Method Development	* Biofuel analysis and testing to regulatory limits * Biofuel blend test runs	BTNZ is involved with the development and amendment of methods for the analysis of NZ biofuels. BTNZ is a member of the Bioenergy Association of New Zealand.
Massey University **Company Profile** **Website** Contact: Atillio Pigneri Ph: +64 (0) 6 350 5600	* Process development and optimisation * Energy analysis * Techno-economic assessment * Infrastructure planning	* Biofuels Research	Massey University Centre for Energy Research (MUCER) and Massey University at large represent a leading knowledge base on bio-energy engineering.
NIWA **Company Profile** **Website** Contact: Rupert Craggs Ph: +64 (0) 9 520 0642	* Fundamental research on algal production, harvest and biofuel conversion. * Desktop studies on suitability and economics of HRAP for wastewater treatment, CO2 biofixation and biomass use as fuel, feed or fertiliser. * Pilot and large-	* Integrated energy efficient wastewater treatment and resource recovery systems. * High Rate Algal Ponds. * Covered Anaerobic Ponds.	A 100 kW advanced steam-blown biomass gasifier has been developed and constructed. Hydrogen-rich (40vol%) syngas is produced. Cold model of the above gasifier is built for fluid dynamics studies. A Fischer-Tropsch reactor is available for liquid fuel synthesis. Pyrolysis reactor is available for biofuel production.

	scale demonstration of HRAP and CAP technologies with industry partners. * Design of HRAP for wastewater treatment and or algal production. * Design of CAP for biogas recovery from wastewater.		
JAGid **Company Profile** **Website** Contact: Andre Hamman **Email**	* Production Technology * Plant Design & Fabrication * Plant Construction & Commissioning * Development of innovative pilot scale concepts to industrial scale operation	* Biodiesel (Used Cooking Oil & Tallow) * Conversion of degraded feedstocks using novel technologies	Strong technical team with proven ability to deliver practical and cost effective solutions.
Scion **Company Profile** **Website** Contact: Michael Jack Ph: +64 (0) 7 343 5601	* NZ woody biomass resource * Feedstock pretreatment technologies * Biomass conversion technologies * Energy modeling and life cycle assessment * Plant and industrial biotechnology * Biomaterials	* Research & Development	Scion's key advantage is the ability to carry out research and development across the entire biofuel production value chain including: * woody biomass resources development and logistics * pretreatment and conversion technologies for biofuels and co-products Assessment and mitigation technologies for improved environmental footprints of biofuels operations

	development * Water and waste management technologies		
Solvent Rescue/ Solray **Company Profile** **Website** Contact: Chris Bathurst Ph: +64 (0)3 336 5018	* High temperature water conversion * Continuous Energy Efficient reactor * Modular fully Scalable * Mark 2 plant operating and planning Mark 3	* Production of Crude Oil from Algae, Seaweed, Pulp, or Sewage Sludge	Solray's key advantage is that the crude oil we produce is fully interchangeable with crude oil from normal fossil sources. Therefore no existing infrastructural changes to refineries, delivery systems, or end users are required. This feature is important to transport and aviation operations. Blends are not necessary.
Taharoa Biofuels Company Profile Contact: Ken Hulls Ph: +64 (0) 7 849 4911 **Email**	* Rapid propagation of using advanced laboratory based technologies * Horticultural propagation * Crop yield trials	* Propagation of *Miscanthus Gigantus* for growing as a feedstock for production of wood fuel or liquid biofuels. * Commercial provider of long term biomass (for energy) supplies	Taharoa C has imported Miscanthus and is currently undertaking 8 trials throughout New Zealand. Taharoa is interested in contracting for other trials and for the commercial supply of feedstock.
University of Canterbury **Company Profile** **Website** Contact: Shusheng Pang Ph: +64 (0) 3 364 2538	* Advanced biomass gasification, pyrolysis and Fischer-Tropsch synthesis of liquid fuel. * Fundamental	* Education Research	A 100 kW advanced steam-blown biomass gasifier has been developed and constructed. Hydrogen-rich (40vol%) syngas is produced. Cold model of the above gasifier is built for fluidynamics studies. A

	research and process simulation. * Process optimisation and design. * Feasibility studies.		Fischer-Tropsch reactor is available for liquid fuel synthesis. Pyrolysis reactor is available for biofuel production.
URS **Company Profile** **Website** Contact: Gael Ogilvie Ph: +64 (0) 9 355 1330	* Project management * Systems thinking * Engineering	* Life Cycle Analysis * Sustainability assessment and labeling * Carbon footprints * Environmental impact assessments * Process engineering * Chemical engineering	URS staff have specialist knowledge of sustainability issues surrounding biofuels and have wide industry contacts in New Zealand.
Biosfuel Ltd	No details provided by the company		
Convertech Ltd	No details provided by the company		
Environfuels	No details provided by the company		
NZ Green Fuel Technologies Ltd	No details provided by the company		
Pukeawa Biofuel Ltd	No details provided by the company		

What and how much is being made in New Zealand?

New Zealand produces most liquid biofuels from used cooking oils (biodiesel) and whey (bioethanol). The summary below sets out the various possible feedstocks and their application in New Zealand.

Biodiesel – sources, details and annual production in New Zealand

Source	Details	Quantities produced annually

Tallow	Tallow is an animal fat, which is a by-product of meat processing. Typically, tallow starts with the extraction of suet from a carcass. Suet is hard fat found in the neighbourhood of the kidneys and around some other organs. While suet can be used as-is, rendering suet removes impurities and also extends the shelf life. Once suet is rendered, it becomes tallow. As long as tallow is stored in an airtight container, in a cool environment, it can keep for an extended period of time. Further details about producing biodiesel from tallow can be found in this EECA Study "Biodiesel from Tallow", by Barry Judd, November 2002. Other details at Meat Industry Association of New Zealand.	New Zealand produces around 150,000 tonnes of tallow per year, most of which could be made into biodiesel. Of this total, 120,000 tonnes is currently exported, principally for use in animal foods and chemicals manufacture, could be used for tallow ester manufacture. 30,000 tonnes are used domestically for stock food, soap,and margarine.
Rapeseed Oil (Canola)	Canola is a genetically engineered plant developed in Canada from the Rapeseed plant, which is part of the mustard family of plants. Rapeseed oil is a penetrating oil, to be used in light industry, not for human consumption. **Process:** Chemical transesterification	Annual Production volume, 1 million litres (currently) - 4 million litres from July 2009
Jatropha	The oil yielding plant Jatropha curcas L. is a multipurpose and drought resistant large shrub, which is widely cultivated in the tropics as a live fence. It produces a non edible fruit which has a high content of oil used to provide the feed stock to produce the biofuel. It has the additional plus of being grown on marginal or arid soils, and does not compete with traditional food crops for land. The jatropha plant can reach a height up to 5m and its seed yield ranges from 7.5 to 12 tonnes per hectare per year, after five years of growth. The oil content of whole Jatropha seed is 30-35 % by weight basis. **Process:** Chemical transesterification	Early trials in Northland in NZ. 2 years before they will bear fruit.
Algae	Half of algae's composition, by weight, is lipid oil which can be converted into algae biodiesel. Various algae contain different levels of oil. Algae are easy to grow and can be manipulated to produce huge amounts without disturbing any natural habitats or food sources. All they need is water, sunlight and CO2. **Process:** Chemical transesterification	Advanced Research /trial stage. No production of fuel yet.
Used Cooking Oils	Used Cooking Oils are an excellent source of biodiesel and are otherwise a troublesome waste product. Removing contaminants such as water and managing the acidity are two key considerations. Several NZ suppliers are producing their biodiesel from used cooking fats. **Process:** Chemical transesterification	An estimated 5,000 tonnes annually of spent cooking oils is available in New Zealand.

Bioethanol – sources, details and annual production in New Zealand

Source	Details	Quantities produced annually
Whey	In New Zealand,bio-ethanol is made as a by-product of the dairy industry. Lactose is fermented in whey with yeast that converts this sugar into alcohol. The disposal of whey is a worldwide problem. Large quantities of whey are produced as a by-product during the manufacture of cheese and casein, and this must be disposed of or processed in an environmentally acceptable way. The key to the utilisation of this resource has been changing the perception of whey from a 'waste material' to an	Anchor Ethanol produces approx 20 million litres annually but not currently for fuel use. 60% is exported. It's hoped that within the next few years 20% of the business will be transport fuel.

	'opportunity' for further processing. **Process:** Fermentation using yeast	
Salix (Willow)	Cultivating willow for biomass is new in New Zealand, although willow is being used overseas as a dedicated energy crop, mostly to fuel municipal heating plants and to produce heat and power. In this country, short rotation willow biomass has potential using transformational technology. Willow biomass can be used for production of ethanol for fuel, lignin for the production of biopolymers and xyulose for food sweetening, with secondary uses as fuel in cogeneration plants (heat and energy generation) and stock fodder. Further details in Energy Farming with Willow in New Zealand **Process:** Hydroplysation and fermentation	Harvesting to begin in 2009/2010. Further details here
Wood	Ethanol can be produced from forest harvest residues or purpose grown trees using enzymes and fermentation organisms. Chemical and physical treatments are often required as part of processing. The co-products of producing ethanol such as lignin and zylose are potentially more valuable than the biofuels. Heavy bio-oils can be produced using pyrolysis processes and this can be used in marine and rail engines. **Process:** Fermentation using enzymes and microbes. Pyrolysis	Demonstration; but potential could be as much as 100 million litres annually
Straw	Thanks to advance sin biotechnology, research can now transform straw, and other plant wastes, into cellulosic ethanol. While chemically identical to ethanol produced from corn, cellulose ethanol exhibits a net energy content three times higher than corn ethanol and emits a low net level of greenhouse gases. Process: acid hydrolysis (or enzymatic hydrolysis) then fermentation using enzymes (converts cellulosic biomass to fermentable sugars), then microbial fermentation to produce ethanol and CO2.	Nothing active in New Zealand (desktop research only).
Food Waste	Putrescible food waste could be used to produce lignocellulosic ethanol for fuel. **Process:** Fermentation	Nothing active in New Zealand (desktop research only).

Growth in NZ Biofuels

Analysis of the number of companies registered in New Zealand as having an interest in liquid biofuels provided the associated **graph**. Clearly the lead up to the introduction of the **Biofuels Sales Obligation** (in October 2008) stimulated the registration of a number of new companies.

NZ Biofuels Potential

The New Zealand Advantage

On the back of the previous Government's Biofuels Sales Obligation several fledgling industry companies have invested several million dollars in good faith and in the belief that they had a sound future. Without doubt the change in approach has not suited all in the industry but one thing is clear,

the present uncertainty will make it increasingly impossible for them to produce and/or market biofuels simply because the requirements are not clear. What this industry needs is a clear policy from Government so that business plans can be progressed.

The benefits of using liquid biofuels are many and more than justify a Government stimulus package to facilitate the growth of a New Zealand biofuels industry/market. The advantages to the New Zealand economy are two-fold: Firstly, they are internal to New Zealand and secondly, they have an impact on an international scale.

Within New Zealand the advantages are economic in nature - enhanced security of fuel supply; the reduction of raw materials sent off shore for processing; the securing of so-called 'green-collar' jobs; and the value maximisation of otherwise poor quality land. Furthermore, the advantages are environmental in nature - the reduction of CO2emissions from transport, heating and stationary equipment applications will assist towards meeting our Kyoto commitments as well as making a tangible difference to the environment in which we live and breathe. Finally, the advantages have a health impact too - reduced transport emissions will have a positive effect on respiratory health. This aspect is pertinent to our major cities, were the rise in PM10 emission levels is of concern.

- **Enhanced security of fuel supply** - indigenous supply of fuel - security of supply especially for New Zealand essential services in times of need.
- **Value added New Zealand raw materials that are currently exported** - the processing of these resources on New Zealand soil bring economic growth advantages by reducing our reliance on imports and providing an increased local taxation base.
- **Employment "green collar" jobs** - the job creation potential is both direct and indirect via multiplier effect.
- **Value maximisation of land** - improved utilisation of land and value creation without rural communities e.g. rotational oilseeds, salix based cellulose to ethanol. Some biofuel crops may well also utilise otherwise poor quality and low value land thus providing increase value for land owners.
- **Reduction of 'wastes' to landfill** - many current bio-waste going to landfill are indeed bio-resources - dairy industry waste lipid streams, grease trap waste and some forestry waste is currently land-filled and yet could be converted into good quality biofuels.
- **Mitigating Kyoto agreement liability due to reduced net GHG emissions from transport** - Reduced CO2 emissions by direct displacement of fossil fuels.
- **Positive health impact** - grass roots improvements in workplace health, biofuels produce far less emissions and don't contain carcinogens and harmful polyaromatic cyclic hydrocarbons (true for both biodiesel and bioethanol). One only needs to refer to the Brazilian experience from using bioethanol and how it has helped to clean up the air in their cities.

From an international perspective, the advantages that investment in liquid biofuels offers to New Zealand are also economic in nature - international investment opportunities), and they are reputational (evidence to support the 'clean green' image New Zealand likes to portray aboard').

- **Investment in R&D and biofuel manufacturing** - developing an industry platform for the eventual deployment of 3rd generation technologies, i.e. establish a proven track record of capability that would provide for future investor confidence,growth of a strong knowledge base and enhanced skill set, e.g. ITO Biofuels,stimulate R&D, promote market acceptance and familiarity with the use and handling of biofuels. (This is a very important aspect and one should not underestimate the learning curve required for successful implementation), capability to harness is less discerning indigenous feedstocks, e.g. Waste lipid streams.
- **Tourism growth by reinforcing the NZ "Clean &Green" image** - in this respect several New Zealand tourism focused companies are already leading the way (Air New Zealand for example). The potential to actively promote New Zealand as an eco-tourism destination (e.g. Great Barrier Island) is significant as interest in so-called eco-tourism is seen around the globe. New Zealand's 'clean - green' image is often overplayed. The use of sustainably produced New Zealand sourced biofuels would further enhance this reputation.

Sustainability Criteria for Biofuels

Good news - New Zealand biofuels are Sustainable biofuels!!

The growing international debate and requirement for 'sustainability standards' for biofuels can only be a good thing for New Zealand.

The growing international debate and requirement for 'sustainability standards' for biofuels can only be a good thing for New Zealand.

It is well known and proven that the existing resources available in New Zealand such as tallow, used cooking oil,rotational oil seed crops and whey are indeed sustainable and moreover, are amongst the best performers in terms of net green house gas emission reductions. Longer term other sustainable feedstocks such as cellulose and algae will be utilised as technological developments evolve.

There is significant potential here for New Zealand to position itself as a leading producer and user of sustainably produced fuels. New Zealand has the unique opportunity to develop a biofuel industry that utilises existing resources that are available on a sustainable basis. By this we mean biodiesel from either tallow (rendered from beef or mutton fat), used cooking oil and fats, vegetable oil from rotational crops, ethanol from whey, ethanol from cellulose, algae oil options, etc.

These resources have a very favourable net reduction in greenhouse gas emissions, they do not compete with food production nor do they threaten conservation areas. Rather they have the potential to reduce waste to landfill and give some value to otherwise low-value land. This is a 'win-win' situation.

It is likely that agreement of definition of 'sustainable' can be agreed for New Zealand and while work is progressing on this it should not be allowed to restrict growth and investment in the industry. To some extent there would be an element of self regulation as it is highly unlikely that any one of the oil companies would knowingly import fuel derived from the destruction of rain forest. Their brand reputation would not tolerate this. New Zealand can only benefit from sustainability mandate.

For international papers on Liquid Biofuels and Sustainability see here

In order to provide New Zealanders with confidence that they are using sustainable biofuels the Energy Efficiency and Conservation Authority (EECA) has established a framework which allows biodiesel producers and retailers to report on the environmental credentials of their products. The reporting is voluntary but monitored by BANZ (Bioenergy Association of New Zealand) and government.

New Zealand's voluntary reporting around the sustainability of the feedstocks used for the production of biofuels is an approach that has, given the size and transparency of the New Zealand market, been easy to implement and administer and is a cost effective approach that has the support of all key players in the sector. It is a win-win for the industry as producers recognise that 'sustainability' sells their product.

The sustainability reporting framework draws on international experience, in particular that of the United Kingdom Renewable Fuels Agency's Renewable Transport Fuels Obligation (UK RTFO) and is consistent with best international practice. Fuels reported on must also meet the New Zealand Fuel Specifications.

A **Technical Note** sets out how the scheme works, what is disclosed by biofuel producers/ suppliers and presents a brief history of why biofuel sustainability needed to be addressed. Supporting materials that helped to inform the process and obtain Parliamentary endorsement are also listed.

Sustainability reporting is a key criteria for accreditation of transport biofuel producers and retailers within the BANZ Biofuel Accreditation Scheme **www.AccreditedBiofuels.org.nz**

New Zealand Biofuels Sustainability Scheme details at **http://www.eeca.govt.nz/node/8082**

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What is New Zealand doing on Sustainability?

Standards New Zealand

ISO Sustainability Criteria for Biofuel - Standards New Zealand sought stakeholder views in late 2008 on whether the International Organisation for Standardisation (ISO) should develop a new international Standard on Sustainability criteria for biofuels'. As a result of this consultation, New Zealand voted for the work to go ahead, and to participate in its development.

A ISO 'Sustainability criteria for biofuel' meeting will be held 8th and 9th June 2009 in Berlin, Germany.The Agenda for this meeting is here

EECA

EECA - has commissioned a project to look at Default values for GHG emissions in the New Zealand Biodiesel supply chains. In particular the study looks at the following:

- Used cooking
- Tallow
- Rapeseed oil

Preliminary findings from the project can be found **here**. Final details are expected in late 2009.

Other EECA Resources include:

- **EECA Presentation on Sustainability of NZ Biofuels (March 2009)**
- **Additional reports on Biofuels Sustainability are on the EECA website**
- **Tallow as sustainable Feedstock for Biofuels - article by the NZ Renders Group of the Meat Industry Association**

Biofuel Legislation and Regulations in NZ

Brief history and current status of Liquid Biofuels in New Zealand

(current at 25 May 2009)

- **3 October 2011** - the Engine Fuel Specifications Regulations 2011 were officially approved on 3 October 2011 and will be coming into effect on 1 December 2011. The new regulations are available on the **New Zealand Legislation website**.
  Further information on the review and decisions that culminated in these updated Engine Fuel Specifications Regulations is available on the **Ministry of Economic Development's website**
- **19 May2009** - The New Zealand Government announced the introduction of the **Biodiesel Grant Scheme.**Further details about the Scheme are available **here**.
- **17 December 2008** - The Biofuel Sales Obligation and associated regulations were **repealed**.
- **17 December 2008** - Energy and Resources Minister Gerry Brownlee indicates the likely introduction of **tax breaks** on fuels coming from **proven sustainable sources.** More **here**.
- **11 December 2008** - Energy and Resources Minister Gerry Brownlee **tabled in Parliament a Bill** to repeal the obligation placed on oil companies to sell a certain proportion of biofuel. More **here**.
- **19 November 2008** - New National Government is formed. National Government indicates its intention to repeal the previous Government's policies on biofuels.
- **1 October 2008** - The **Biofuel Sales Obligation** commenced under the then Labour Government.
- **3 September 2008** - The Legislation to bring into force the Biofuel Sales Obligation, the Biofuel Bill, was passed through Parliament.

Government Roles in Liquid Biofuels

The key Government Ministries involve din the regulation of liquid biofuels in New Zealand are:

- The Ministry of Economic Development (MED);
- The Energy Efficiency and Conservation Authority (EECA);and
- The Ministry of Transport (MoT).

Other Government Departments /Ministries with a minor role in biofuels are the **Ministry of Consumer Affairs** and**Customs and Excise** as outlined below.

Ministry of Economic Development (MED) – Biofuels are governed under MED who administer funds for commercialisation of biofuels, fuel standards, legislation, and standards for sustainability. MED more here

Energy Efficiency and Conservation Authority – The Energy Efficiency and Conservation Authority (EECA) promotes sustainable energy by changing the way New Zealanders think about, and use energy. EECA works to raise community awareness of energy efficiency and renewable energy issues and provides businesses and individuals with the tools to make changes. EECA develops programmes to meet the needs of specific markets, often working in partnership with other organisations. As part of its Renewable Energy Programme EECA promotes activities on bioenergy generally and including biofuels in order to encourage uptake. EECA produces a considerable range of information and resources relating to biofuels, their production and use. Further details about EECA's activities are available **here**.

Ministry of Transport (MoT) - The Ministry of Transport's Environment group has principal responsibility to provide leadership in the management of the environmental and public health impacts of transport as part of the development of a sustainable transport system. MoT's roles are limited to encouraging demand for biofuels in transport fleets, and with fuel or road tax issues to the extent that they affect biofuels. The Ministry of Transport also present a number of useful consultancy reports, policy details and 'Question's and Answers' on biofuels. For further details about MoT's activities in relation to biofuels and information available **here**. Information on the policy decisions behind the Biofuels Sales Obligation can be found **here**.

Ministry of Consumer Affairs (MoCA) – The Ministry of Consumer Affairs test the quality of all transport fuels under the Fuel Quality Monitoring Scheme. (Further details under **Testing and Certification** and **Fuel Quality Specifications.**

Customs and Excise – A license for the manufacture of biofuels must be granted by Custom's and Excise (further details under **Manufacturing Regulations**).

Standards and Quality - Key Regulations

Biodiesel	**Bioethanol**
Specification – yes Licence required to produce? - yes	Specification – yes Licence required to produce? - yes
Fuel Quality Specifications	
Fuel Quality Specifications - Petrol, diesel, ethanol, biodiesel and biofuel blend quality in New Zealand is governed by a set of regulations designed to protect consumers and the environment. These are the Engine Fuel Specifications Regulation. The 2008 regulations were updated on 3 October 2011 and come into effect on 1 December 2011. The new regulations are now referred to as the ***Engine Fuel Specifications Regulations 2011.*** The original Engine Fuel Spec Regulations 2008 replaced the Petroleum Product Specifications Regulations 2002 on the 1st of July 2008. See***Testing and Certification*** for enforcement of the Regulations. They are enforced by MED and the Ministry of Consumer Affairs.	

Further information on the review of the 2008 Fuel Specification Regulations and the decisions that culminated in the updated Engine Fuel Specification Regulations 2011 is available ***here***.

10 - Biodiesel component of diesel/biodiesel blends sold by retail sale **16 -Requirements relating to biodiesel sold by non-retail sale**	**8 - Ethanol component of petrol/ethanol blends sold by retail sale** **14 -Requirements relating to petrol/ethanol blends sold by non-retail sale**

Manufacturing Regulations

Biodiesel Manufacture and Ethanol Manufacture – Licence required from Customs and Excise

Biodiesel was included as a fuel in Schedule 3 of the Customs and Excise Act1996 on 1 October 2008 and consequently areas where biodiesel is now manufactured are required to be licensed by Customs. Biodiesel is currently excise rated "Free" and is subject to the Petroleum and Engine Fuels Monitoring Levy (0.045 cents per litre).

Ethanol used as a fuel is excise-free provided an application is made to the Chief Executive of **Customs** and approval granted by him. Otherwise, ethanol attracts a substantial excise charge per litre of alcohol due to its potential use as a drinkable spirit. The exemption to the requirements to be a Customs controlled area for personal use of ethanol only extends to drinkable spirits, not to the use of ethanol as fuel.

Anyone making biodiesel or bioethanol must make an application to be granted a licence as a Customs controlled area. See the **Customs website** or call 0800 428 786 for more information.

Safety Issues

Some chemicals used to manufacture biodiesel are flammable and require the use of specialised electrical equipment to maintain safety in the presence of flammable materials.

Most electrical equipment in biodiesel manufacturing plant will require installation and inspection by appropriately qualified electrical workers. Such electrical equipment should be accompanied by documentation confirming its safety and suitability for use in New Zealand, and include safety instructions for its operation and maintenance. It is critical that these instructions are followed. Likewise, naked flames must be avoided in the vicinity of biodiesel manufacturing plant.

For further information on electrical or gas safety, contact the Energy Safety Service on telephone number 0508 377 4636. You can also visit the **Energy Safety web site**.

ASTM Standards - Blends (Biodiesel and bioethanol)

Bioethanol blend specifications

ASTM D 5798: Standard Specification for Fuel Ethanol (Ed75-Ed85) for Automotive Spark-Ignition Engines - This specification covers a fuel blend, nominally 75 to 85 volume % denatured fuel ethanol (Ed75-Ed85) and 25 to 15 additional volume % hydrocarbons for use in ground vehicles with automotive spark-ignition engines. Fuel ethanol(Ed75-Ed85) shall conform to the performance

requirements prescribed. Fuel ethanol(Ed75-Ed85) shall be visually free of sediment and suspended matter. The hydrocarbon/aliphatic ether blend content, vapour pressure, acidity, pH requirements, gum content, inorganic chloride, water requirements, copper requirements, and sulphur requirements shall be tested to meet the requirements prescribed.

ASTM D 4806: Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel - This specification covers nominally anhydrous denatured fuel ethanol intended for blending with unleaded or leaded gasolines for use as a spark-ignition automotive engine fuel. Denatured fuel ethanol shall conform to the specified performance requirements for the following: ethanol content, methanol, solvent-washed gum, water content,denaturant content, inorganic chloride content, copper content, acidity, pHe, sulfur content, sulfate content, appearance, and specific gravity. The only denaturants used for fuel ethanol shall be natural gasoline, gasoline components, or unleaded gasoline at the minimum concentration prescribed. Prohibited denaturants include methanol which does not meet the specified requirement, pyrroles, turpentine, ketones, and tars (high-molecular weight pyrolysis products or non fossil vegetable matter). Sampling, containers and sample handling techniques, and the test methods for determining conformance to the specified requirements are given.

Biodiesel blend specifications (ASTM October 2008)

ASTM D6751-08: Revised to include the requirements of a cold soak filterability test that controls minor compounds and provides amore accurate reading of how the fuel will perform in cold weather conditions.

ASTM D975-08a: Specification for Diesel Fuel Oils(on- and off-road applications) - revised to allow for up to 5% biodiesel content. This allows B5 blends to be treated the same as conventional diesel for testing purposes. Now listed as **ASTM D975-09**.

ASTM D396-08b: Specification for Fuel Oils (home heating and boiler applications) - revised to allow for up to 5% biodiesel content. Like D975, this revision allows B5 blends to be treated the same as conventional fuel oil for testing purposes. Now listed as **ASTM D396-09**.

ASTM D7467-09: Specification for Diesel Fuel Oil,Biodiesel Blend (B6 to B20) - a newly created Standard governing the properties of blends containing between 6 and 20% biodiesel for on- and off-road applications.

Testing and Certification

Ensuring a quality product should be the aim of any biofuels manufacturer. The product needs to be tested and confirmation established that it meets the standards.

The fuel quality regulations (*Engine Fuel Specifications Regulations 2008)* are enforced by **MED/Ministry of Consumer Affairs** who carry out random spot sample checks of biofuels and mineral fuels sold to ensure that they meet the specs and have the power to prosecute if they do not. Further details are available from the Ministry of Consumer Affairs - **Fuel Quality Monitoring**

EN Test Method14103 - The test method for esters in biodiesel (EN 14103) has recently been

amended. The need to allow an amendment of EN 14103 is to account for the presence of naturally occurring C-17 methyl ester, which is used as an internal standard. It has been acknowledged internationally that the ester content can appear low in the test as a result of C17 interference. The method was revised as of 7 July 2007. Further details **here** from the Ministry of Consumer Affairs web-site. The BANZ submission to the consultation process can be found **here**.

Fuel Quality Testing labs in New Zealand

- **Biofuel Testing New Zealand -** Biofuel Testing New Zealand is part of Independent Petroleum Laboratory Limited (IPL). IPL is a fully independent joint venture company specialising in the testing and analysis of fuels, biofuels and environmental samples. Contact **here**

If you carry out biofuel quality testing and would like to have your details listed here please **contact us**.

Liquid Biofuels Grants and Funding

Grant Funding

On 19th May the New Zealand Government announced the introduction of the **Biodiesel GRANTS Scheme**

Further details about the Scheme are available **here** with further details set out in the Biodiesel Grants Scheme Description Document **here**

The Biodiesel Grants Scheme - the Producer Application Form is now available on the EECA website through this **link**

Research Funding

There are two key sources of funds available specifically to promote the development of biofuels in New Zealand

Foundation for Research,Science & Technology (FRST):

- The Low Carbon Energy Technologies Fund seeks to assist public and private organisations who have completed basic research and have demonstrated the potential of a new technology at proof of concept stage, to move through the pilot/ demonstration plant stage.

New Zealand Trade and Enterprise (NZTE):

- Enterprise Development Grants
- Australia New Zealand Biotechnology Partnership (ANZBPF)
- General (non-financial) support for business development

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Who's using Biofuels in New Zealand?

BANZ has recently undertaken a survey to establish more information on who in New Zealand is using biofuels and what their experiences are. This page will be updated soon with the results including blends, distances travelled, vehicles make and model, experiences and location used.

Are you using biofuels? Tell us about your experiences using the form below

- **BANZ motor vehicles and biofuels survey - information**
- **BANZ motor vehicles and biofuels survey form**
- **"Fueling up on recycled cooking oil"**, NZ Tourism Company Fuels Fleet on Bio-diesel
- **"Fish 'n' chip oil fuelling tourist bus"**, Stray, a "hop-on-hop-off"bus network aimed at the backpacker market fuels its bus on used cooking oils
- **Air New Zealand** –Jatropha Oil test flight hailed as a success
- **Environment Canterbury** biofuel Metrobus Trials (with Bio Diesel Oils Limited)
- Christchurch urban bus and coach tour company **Leopard Coachlines** has changed over to a biodiesel blend for its entire fleet of 100 vehicles (with Bio Diesel Oils Limited)
- **Tourism company** operates vehicles on 100% Waste Vegetable Oil
- **Rotorua Duck Tours** specialises in introducing Rotorua's rich history and viewing some of its spectacular scenery. Rotorua Duck Tours offer amphibious sightseeing tours that are like no other, all powered by Environ Fuels
- A **Kaikoura backpackers** has slashed a massive 92% off the cost of its hot water bill by re-using cooking oil from local takeaways and restaurants to fire its boiler
- **Biodiesel first for New Zealand championship - NZ Rally** - Leading the way for competition using environmentally friendly energy, Rangiora's Matt Summer has the honour of starting this weekend's opening round of the Vantage New Zealand Rally Championship as the first team to use biodiesel as a fuel. Biodiesel is supplied by Rangiora based company - **Kiwifuels**. More details **here**.
- **Biofuel-powered around-the-world record-holder visiting southern ports** - both **Biodiesel New Zealand**and **Ecodiesel** have been supplying fuel for the southern leg of port calls by Earthrace, the biodiesel powerboat which made a record-setting global circumnavigation in2008. More details **here** and further details **here**.

Biofuels Research/Development in New Zealand

Research News

- **Scion Report** - **Biofuels Science Symposium and Action Plan (Feb 2011)** - Transportation biofuels and co-products derived from grasses, wood, and algae have the potential to displace a significant proportion of fossil-based fuels and chemicals in New Zealand. To fully exploit this opportunity requires a coordinated scientific research effort

across New Zealand's research organisations. As a first step along this path, Scion - the lead Crown Research Institute in woodrelated bioenergy1 - hosted a Science Symposium on Next Generation Liquid Biofuels and Co-Products in December 2010. This Symposium was the first of its kind in New Zealand and provided a forum for the New Zealand biofuels research community to share their science, engage in scientific debate, and learn about international developments in the biofuels areas.

The Symposium intended to complement other fora with a policy or commercial focus to ensure that appropriate synergies between research and development activities are built and that collective work remains both leading edge and relevant to the needs of New Zealand.

New Zealand companies involved in research in the liquid biofuels area are listed below:

Who	What	Where and What we know
Solray **Solray = Solvent Rescue** Contact: Chris Bathurst and BL Rayners Ltd Contact: Wayne Harpur Christchurch	**Algae** - 'turning sewage algae intro crude oil. Process is now operational but commercial testing unlikely until April 2009.	Website : **Solvent Rescue** Articles: **OilGae Blog -Jan 09** **OilGae Blog -Jan 07** **Southland Times Article**
NIWA (National Institute for Water and Atmospheric Research) Contact: Rupert Craggs	more here	more here
Aquaflow Bionomic Corporation Contact: Nick Gerritsen, Marlborough	**Algae** - biofuel from wild algae harvested from open-air environments; currently building a pilot plant capable of producing1 million litres annually.	Website: **Aquaflowgroup.com** Email: **aquaflowgroup**
Cawthron Institute Contact: Mike Packer, Nelson	**Algae** - study of the **prospects for land-based aquaculture** in New Zealand. Basic research on the utilisation of micro-algae as an energy source	Website: **Cawthorn Institute**
Scion Contact: Elspeth	**Pulp and paper** - Scion and AgResearch have partnered with San Diego-based	Website: **SCION**

MacRae, Rotorua	Diversa on a feasibility study to determine whether or not a pulp and paper mill can be converted to turn its waste into biofuel.	Articles: **NZTE** **NZFOA**
BioJoule (now part of Pure Power Global) Contact: Jim Watson, Taupo	**Salix** - BioJoule was launched in 2006 with a commitment to energy farming and a three-pronged business approach for using the woody crop salix. When the shrub is harvested, says founder Jim Watson, it can provide cellulose for the production of transport ethanol; lignin for a plastic substitute; and xylose as a sweetener with non-diabetic properties.	**NZTE** **Genesis**
Alternative Energy Solutions Ltd (AES) Contact: Gavin Hedley, Pukekohe, Auckland	**Biomas Liquefaction via pyrolysis** - Pyrolysis of wood waste (hogged forest residue) to produce bio-oil. Significant advantage of mobile in-forest operation as bio-oil is a liquid fuel with about double the energy density of a hog fuel.	Plant under construction in Auckland. **BANZ and Massey Energy Research workshop - 12 March 2008**
Lanzatech Contact: Dr Sean Simpson, Auckland	**CO and Waste gases** - Lanzatech has developed a technology to allow high volume industrial waste streams to become a resource for bio-ethanol production. This technology has been developed and demonstrated in their purpose built laboratory. The company is now embarking on a process refinement and scale-up plan. The process uses microbes to convert CO and other industrial gases into ethanol.	Articles: **NZ Herald** **Dominion Post** **Chemical &Engineering News**
New ZealandCentre for Ecological Economics (NZCEE) Contact: Vickie Forgie	**Bioenergy Options for New Zealand Project** - including a focus on the use of canola for biodiesel	Website: **NZCEE**

If your details are not in this table and you would like them to be – **contact us**