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Australia

Biofuels Annual

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Report Highlights:
In 2012 Australia produced approximately 440 million liters of ethanol and 350 million liters of biodiesel. While biofuels currently account for less than one percent of Australia's liquid fuel production and consumption there is significant research and development being undertaken to investigate potential new sources of biofuels.

I. Executive Summary

Biofuels account for approximately one percent of liquid fuel production in Australia and for less than one percent of Australian energy consumption. Over the next five years productive capacity will expand but even if planned capacity is fully utilized total consumption will still only represent a small proportion of total liquid fuel consumption.

Overall energy consumption in Australia is growing moderately due to increased energy efficiency. Australia has a renewable energy target which aims to generate 20 percent of electricity from renewable sources by 2020. However currently this target is primarily being met through development of solar and wind energy.

Currently only one state (New South Wales) has a mandated level of ethanol use of six percent. A five percent mandate had previously been proposed for the state of Queensland but is not likely to be implemented in the near future. A proposal for a five percent mandate nationally has also recently been presented to the Australian Federal Parliament. If passed, this would increase demand significantly.

Australia currently has capacity to produce up to 440 million liters (ML) of ethanol per year with additional capacity of 173ML expected from 2016 onwards. The majority of ethanol fuel sold in Australia is blended at a rate of 10 percent as there are few vehicles capable of running on higher rates of ethanol blend.

In 2012 biodiesel production was approximately 350ML however; total capacity is estimated at 500ML. These facilities primarily use a combination of tallow and used cooking oil as feedstock, depending on availability and cost which varies seasonally. A new plant under construction with expected capacity of approximately 288ML will use soybeans as a feedstock.

Although biofuels currently only account for a small portion of energy production and consumption in Australia, there is significant research and development being conducted into alternative sources of biofuels including several trees species. Australia has also been identified as an optimal location for growing algae which can be used to produce a number of products including biofuel.

II. Policy and Programs

International

Australia has been a member of the APEC biofuels task force since its inception in 2006. This task force was created by APEC in response to high oil prices in that same year. Other member countries of the APEC biofuels task force include Canada, Japan, Korea, New Zealand, Singapore, Chinese Taipei, Thailand, the United States and Vietnam. Malaysia, Mexico and Brazil subsequently joined the group. The main objective of the biofuels task force is to assist APEC members to better understand the potential for biofuel to displace oil in transport.

The Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) together with Sandia National Laboratory (USA) was awarded funds from the APEC Biofuels TaskForce to investigate the potential for biofuel production from algae. The project found that by using human and animal waste as a nutrient source algae from APEC countries could potentially produce up to 20 billion liters of biodiesel per annum. Using waste water from existing power plants to feed algae could realistically produce up to 38 billion liters of biodiesel per year. This would displace 10 per cent of conventional diesel use in Australia.

Federal

The Australian government's *Clean Energy Future Plan* has committed $17 billion over the next 10 years to research and development of clean energy technology, including allocating $20 million to the Advanced Biofuels Investment Readiness program. A biofuels production target of 350 ML was set in 2008 and the Australian Government implemented a range of policy instruments including, fuel taxes (excise), fuel quality standards, grants and labeling to achieve this target. The 350 ML target was surpassed some time ago but biofuel producers and importers remain exempt from the 38.143 cents per liter federal fuel excise. Businesses using biofuels can also apply for a fuel tax credit of between 4.89 cents per liter and 38.143 cents per liter depending on the type of fuel and how it is used.

Also part of the *Clean Energy Plan* was the introduction of a carbon tax which has operated since July 1, 2012. The carbon price is currently $23 per ton and applies directly to the 250 largest emitting entities - primarily electricity generation, transport and industrial processing. Treasury modeling predicts that as a result of the carbon tax, from 2020 biodiesel will begin to replace conventional fuel in the heavy transport industry. This was based on an expected carbon price of at least $29 per ton by 2020. However, the Australian carbon price is due to float with the European Union (EU) carbon price from 2015 and the EU price is expected to remain under €10 (≈$USD13) until at least 2020 which may delay the substitution of fuel.

In April 2013 the Federal Government provided $2.5 million for a feasibility study to examine the electricity generation required to drive future economic development in North Queensland. The study will also examine the potential to sustainably develop up to 120,000 hectares of land for sugarcane production and associated milling, ethanol, and cogeneration infrastructure.

State

New South Wales

Beginning October 2011, the NSW State government increased its mandate for ethanol inclusion to six percent, from the previous level of four percent. Under this mandate, each supplier of wholesale fuel for sale is required to provide evidence that total ethanol sales equal or surpass six percent of total sales. According to sources, the NSW mandate was expected to be the primary driver for growth in ethanol demand in Australia.

From January 2012 a biodiesel mandate of five percent has also existed in New South Wales.

The Australian Lot Feeders Association (ALFA) which is the peak lobby group for the intensive cattle feeding industry is opposed to government policies which support and protect the grain derived ethanol sector. ALFA is concerned that currently policies including mandates and excise exemptions are supporting inefficiency and potentially caused damage to the feedlot industry by increasing the cost of grain.

Queensland

Under the Liberal-National Government elected in March 2012 the state of Queensland has set a goal of being recognized as a leader in bio-based industrial products and technology in the Asia-Pacific region by 2020. However, the mandate for the sale of ethanol and biodiesel in Queensland has been delayed indefinitely.

In line with this commitment the Queensland Alliance for Agriculture and Food Innovation (QAAFI) received a $1million government grant in October 2012 to examine the potential for using eucalypts, sugarcane bagasse and legume sources to produce commercially viable quantities of biofuels. This builds on the $500,000 grant received by QAAFI in early 2012 to investigate the potential for using the tree legume *Pongamia pinnata* as a method of land rehabilitation for coal mines and a source of biofuel. The legume also has the potential to be used as a feedstock and for sequestration of carbon.

The most recent results from the QAFFI study indicate that the existing technology would only be cost-competitive only if crude oil prices were significantly higher, $301 per barrel for sugarcane, $374 per barrel for *pongamia* and $1,343 for microalgae. Further research and technological improvements are estimated to reduce these prices to $168, $255, and $385 per barrel respectively.

QAAFI is also a member of the Queensland Sustainable Aviation Fuel Initiative (QSAFI) which was created to support efforts to establish a significant biofuel manufacturing facility in Queensland. Other partners include: the University of Queensland, the Centre of Excellence for Integrative Legume Research; James Cook University, Boeing, Virgin Australia, Mackay Sugar Limited, IOR Energy and the US biotech Amyris. The first stage of the QSAFI program, which began in 2010, raised $6.5 million. This funding is being used to develop improved methods of converting carbon from sucrose into chemical compounds which can be used as aviation fuel molecules.

Western Australia

In 2012 a Chinese based company, Kimberley Agricultural investments (a subsidiary of Shanghai Zhongfu) was awarded the tender to develop 13,400 hectares of land in the Ord River area of northern Western Australia. The company was originally awarded the tender based on plans to grow sugarcane and develop a sugar processing mill. However, on May 29, 2013 the company and the Western Australian government announced that the land will instead be used to grow grain sorghum which is likely to be processed into ethanol.

An American company, Aurora Algae has run a pilot study in Western Australia over the last three years to investigate the potential to use algae as a source for biofuels. As a result of the study the company has recently released plans to build a facility capable of producing omega-oils, aqua-feed and biofuels. At this stage the primary commercial product will be omega-3 oil for health food supplements and natural food coloring while biofuel is produced as a co-product. A study conducted in partnership between the University of Western Australia and Murdoch University has identified the Pilbara region of Western Australia as an ideal location for algae production. The proximity to the Western Australian iron ore mining sector also increases the value of producing biofuel in that region.

Conventional fuel use projections

The Australian Bureau of Energy and Resource Economics (BREE) recently released energy production and consumption projections through until 2050. As in many developed countries Australia is experiencing a decline in energy intensity which is expected to moderate the growth rate of energy consumption. While not definitive forecasts, these estimates are a robust assessment of the likely trends in energy supply, consumption and trade over the next 40 years. Table 1 shows the medium range projections for conventional fuel usage across different industry sectors. Official forecasts are made in terms of total petroleum products, thus current data on the proportions of gasoline and diesel consumed by each sector were used to estimate future consumption.

Table 1 Australian fuel use projections

Calendar Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Gasoline Total	17,632	17,835	18,038	18,241	18,444	18,647	18,850	19,053	19,256
Diesel Total	20,000	20,619	21,238	21,857	22,476	23,095	23,714	24,332	24,951
On-road	7,217	7,440	7,663	7,887	8,110	8,333	8,556	8,780	9,003
Agriculture	3,299	3,401	3,503	3,605	3,707	3,809	3,912	4,014	4,116
Construction/mining	7,423	7,653	7,882	8,112	8,342	8,571	8,801	9,031	9,260
Shipping/rail	825	850	876	901	927	952	978	1,003	1,029
Industry	1,237	1,275	1,314	1,352	1,390	1,429	1,467	1,505	1,543
Heating									
Jet Fuel Total	412	425	438	451	463	476	489	502	514
Total Fuel Markets	38,045	38,879	39,714	40,549	41,383	42,218	43,053	43,887	44,722

Most of the increase in gasoline and diesel consumption in Australia is expected to be met through imports however production of liquid petroleum gas (LPG) is increasing rapidly. A total of seven new LNG plants are under construction which will more than triple productive capacity by 2017. These plants are primarily focused on export markets but by 2050 gas is also expected to account for 34 percent of total energy use in Australia.

Australia also has significant unconventional oil resources similar to the shale oil currently produced in the United States. There is currently no production from these resources.

Table 2 Liquid Natural Gas (LNG) production

Plant	Capacity (MT)	Production from	Comments
North-west shelf venture	16.3	1989	
Darwin LNG	3.7	2005	

Pluto Gas Field	4.3	2005	
Queensland Curtis LNG	8.5	2014	World's first coal-seam gas to LNG plant
Gladstone LNG	7.8	2015	
Australia-Pacific LNG	9	2015	
Greator Gorgon Area	15	2015	Includes a domestic gas plant
Ichthys	8.4	2016	Will also produce 100,000 barrels of light oil per day
Wheatstone	8.9	2016	Includes a domestic gas plant
Prelude	3.7	2017	World's first floating LNG plant
TOTAL Capacity - 2017	**85.6**		

Trade Policy

All biodiesel and ethanol imports to Australia attract a Customs Duty rate of AU$0.38143 per liter. However, countervailing and dumping duties have been added to biodiesel imports from the United States following concurrent dumping and countervailing duty investigations. The "Countervailing Duty" and "Dumping Duty" is expected to be in place for a total of five years until April 18, 2016. The rates for calculating the total duty payable are confidential and only made available by Australian Customs upon full payment by the importer.

Despite the implantation of these measures, official trade data shows the continued importation of biodiesel from overseas suppliers, including the US and Canada.

III. Ethanol

Production

There are only three ethanol producers in Australia, the largest of which is the Manildra distillery in New South Wales. Total productive capacity is approximately 440 ML per year of which approximately 360ML is used to meet the six percent ethanol mandate in NSW. It is expected that production capacity for these plants could increase to 613 ML per year by 2016.

Official estimates on feedstock consumption are not available for operational ethanol plants. Estimates for consumption of wheat and sorghum as a feedstock for ethanol have been made based on individual company information and industry estimates of conversion rates. If fully utilized, current ethanol production capacity would consume approximately 2.5 percent of average Australian wheat production and 10 percent of average sorghum production. While production does fluctuate due to seasonal conditions the proportion of grain production directed to ethanol is not sufficient to impact significantly on grain stocks for other uses. Both ethanol plants which use grain as a feedstock produce food and animal feed co-products as well.

Due to the variability in conversion rates for molasses to ethanol it is not possible to estimate the amount of molasses consumed based on ethanol production capacity.

Two additional ethanol plants which will use sugarcane bagasse as a feedstock are in the construction stage and are expected to add a further 173ML of ethanol production per year. The Austcane plant will produce approximately 100ML of ethanol plus 49,000 mega watt hours (Mwh) of electricity while the North Queensland Bio-energy plant will produce approximately 73ML of ethanol and between 80 and 85Mwh of electricity from 2016.

Table 3 Ethanol production facilities in Australia (Biofuels Association of Australia)

Plant	Location	Capacity (ML)	Feedstock	Status (as of 01.01.12)
Manildra Ethanol Plant	New South Wales	300	Waste starch (wheat flour)	In production, capacity expanding
Dalby Bio-refinery	Queensland	80	Red sorghum	In production
Sarina Distillery	Queensland	60	Sugarcane	In production
TOTAL CAPACITY		**440**		

Consumption

Between 2009 and 2012 the percentage of households using ethanol blended fuel (EBF) to power their primary vehicle increased from three to six percent. This has been partly driven by an increase in the number of sites selling EBF from approximately 250 in 2007 to over 1500 in 2010 (latest available data). The number of sites selling EBF is continuing to increase and thus consumption is also expected to increase at a moderate rate. EBF is generally less expensive than regular unleaded gasoline in Australia which rather than increasing consumption actually enforces a general perception that EBF provide lower rates of fuel efficiency. The implementation of significant policy changes such as broader mandated ethanol targets would significantly increase consumption.

Almost all ethanol fuel sold in Australia is a 10 percent blend (E10). The only Australian-made cars which are designed to run on higher rates of ethanol blended fuels are the Holden VE II Commodore series. Since 2009 Holden has also used E85 for all vehicles in their V8 Supercars racing team. There are also a few selected imported models which will are suitable for ethanol blends up to 85 percent.

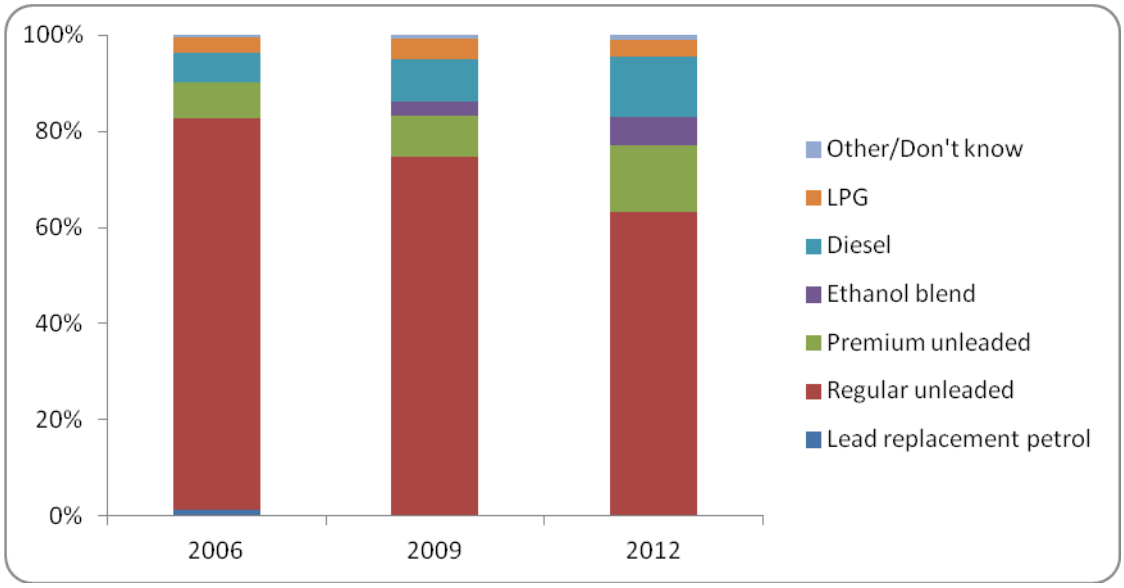

Figure 1 Fuel use in primary vehicle by household (ABS)

Trade

Australia applies a five percent plus $AU0.38143 per liter tariff on ethanol imports which has effectively prevented trade in ethanol as consumption for fuel. Official data does not report imports or exports of liquid biofuels as any trade is not of a commercial quantity.

Table 4 Ethanol Production and Consumption

Ethanol Used as Fuel and Other Industrial Chemicals (ML)									
Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Beginning Stocks		0	0	0	0	0	0	0	0
Fuel Begin Stocks (ML)	NA	0	2	3	4	5	6	7	7
Production	42	84	149	203	380	440	440	440	440
Fuel Production (ML)	42	84	149	203	380	440	440	440	440
Imports									
Fuel Imports	0	0	0	0	0	0	0	0	0
Exports		0	0	0	0	0	0	0	0
Fuel Exports (M LPA)	0	0	0	0	0	0	0	0	0
Consumption									
Fuel Consumption (ML)		84	149	203	380	440	440	440	440
Ending Stocks									
Fuel Ending Stocks (ML)		2	3	4	5	6	7	7	7
Production Capacity									
Number of Refineries	3	4	4	4	4	3	3	3	3
Nameplate Capacity	120	120	189	456	440	440	440	440	440
Capacity Use (%)	35%	70%	79%	45%	86%	100%	100%	100%	100%
Co-product Production (1,000 MT)									
Electricity	0	0	0	0	0	0	0	0	0
Feedstock Use (1,000 MT)									
Wheat*	545	545	545	545	545	545	545	545	545
Sorghum	0	0	0	200	200	200	200	200	200
Molasses	NA	NA	NA	NA	NA	NA	NA	NA	NA
Market Penetration (Liters - specify unit)									
Fuel Ethanol	0	84	149	203	380	440	440	440	440
Gasoline	25833	25219	22331	19503	18198	17574	18,228	18,500	18,800
Blend Rate (%)	0.0%	0.3%	0.7%	1.0%	2.1%	2.5%	2.4%	2.4%	2.3%
* Wheat consumption based on theoretical ethanol yield of 0.55L/kg (132 gal/MT)									

IV. Biodiesel

Production

In 2012 total biodiesel production in Australia was approximately 350 ML. However biodiesel production capacity is already 500 ML. Current biodiesel production is primarily based on the use of by-products such as tallow and used cooking oil however there are several projects to investigate other potential sources such as algae, and several species of trees. The National Biodiesel plant in New South Wales is expected to consume 1.1MMT per year of soybeans when production begins and up to 1.36MMT after the first five years.

Data on feedstock usage is not available as all plants in production use a variety of feed sources depending on price and availability. The conversion rates achieved from different feed sources vary widely and are commercial in confidence data for each plant.

Table 5 Biodiesel production facilities in Australia (Biofuels Association of Australia)

Biodiesel plant	Location	Capacity (ML)	Feedstock	Production start date	Status (at 01.01.12)
ARF Largs Bay	South Australia	45	Tallow, Used cooking oil	2006	In production
ARF Picton	Western Australia	45	Tallow, Used cooking oil	2006	In production
BIA Biodiesel Plant	New South Wales	20	Used cooking oil, Vegetable oil	2003	In production
ARF Barnawatha	Victoria	60	Tallow, Used cooking oil	2006	In production
Ecotech Biodiesel	Queensland	30	Tallow, Used cooking oil	2006	In production
Smorgon Fuels – BioMax Plant	Victoria	15-100	Tallow, Canola Oil and Juncea Oil	2005	In production, possible expansion
Macquarie Oil	Tasmania	15	Poppy Oil, waste vegetable oil	2008	In production
N/A	Northern Territory	130	Palm Oil		Not in production
National Biodiesel	New South Wales	288	Soybeans	2013?	Under construction
TOTAL CAPACITY (ML)		**≈650**			

Consumption

Biodiesel in Australia is generally sold at blend rates of five percent or 20 percent. Consumption of diesel is increasing from 13 percent of households using diesel to fuel their primary vehicle, up from 9 percent in 2009. Based on this pattern continuing, consumption of biodiesel is expected to increase at a similar rate.

Trade

Australia exported 10ML of biodiesel in 2012 of which 50 percent went to China and 36 percent to South Korea. Export data prior to 2012 is not available from official sources. The harmonization of biodiesel tariff codes from 2012 will provide much more accurate reporting on biodiesel trade.

Industry sources indicate that over 10 ML of biodiesel will be exported to the United States in 2013. This increase has been attributed to the recent fall in the Australian dollar which increases the competitiveness of Australian exports. As productive capacity is significantly higher than domestic consumption demand, assuming the Australian dollar remains stable, it could be expected that exports will rise in the short term.

Australia imported approximately 21ML of biodiesel in 2012. Import figures from 2012 are more difficult to estimate due to inconsistent tariff code classification. Table 6 shows official data on biodiesel imports under historical and current tariff codes.

Table 6 Australian biodiesel imports

Biodiesel imports	Unit	2006	2007	2008	2009	2010	2011	2012
HS 3826, Biodiesel And Mixtures Thereof	ML	NA	NA	NA	NA	NA	NA	21.41
HS 3824.90.30.46 Biodiesel component of blends of biodiesel and other	ML	2.14	5.15	2.52	11.1	8.53	24.98	NA
HS 3824.90.20.20 Biodiesel manufactured by chemically altering vegetable oil	ML	0.00	1.60	1.37	0.02	0.00	0.00	NA
TOTAL		2.14	6.75	3.89	11.12	8.53	24.98	21.41

Table 7 Biodiesel Production, Consumption Supply and Demand

Biodiesel (Megaliters)									
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Beginning Stocks	0	0	0	0	0	0	0	0	0
Production	21	54	50	85	130	250	350	400	450
Imports	2	7	4	11	9	25	21	20	19
Exports	0	0	0	0	0	0	10	20	25
Consumption	23	61	54	96	139	275	371	420	469
Ending Stocks	0	0	0	0	0	0	0	0	0
Production Capacity									
Number of Biorefineries	7	7	9	8	6	7	7	8	8
Nameplate Capacity	380	380	380	380	380	380	450	600	600
Capacity Use (%)	5.5%	14.2%	13.2%	22.4%	34.2%	65.8%	77.8%	66.7%	75.0%
Feedstock Use (1,000 MT)									
Tallow	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cooking Oil	NA	NA	NA	NA	NA	NA	NA	NA	NA
Market Penetration (Liters - specify unit)									
Biodiesel, on-road use	23	61	54	96	139	275	371	420	469
Diesel, on-road use	10,300	18,900	12,400	10,800	11,100	10,686	12,000	9,478	9,791
Blend Rate (%)	0.2%	0.3%	0.4%	0.9%	1.3%	2.6%	3.1%	4.4%	4.8%
Diesel, total use	30,326	29,605	25,359	22,040	21,953	21,808	18705	19343	19981

V. Advanced Biofuels

There is currently no commercial production of advanced biofuels in Australia. As outlined in Section II several projects are underway to investigate the potential for advanced biofuel production.