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5 November 2013

The Secretary
Committee on the Northern Territory's Energy Future
GPO Box 3721
DARWIN NT 0801

Emailed (contef@nt.gov.au)

Dear Ms Julia Knight

Submission for Inquiry into the Northern Territory's Future Energy Needs

The purpose of this submission from Bioenergy Australia is to alert the Committee to the status and significant role bioenergy could make towards the provision of base-load power and towards transportation fuels in Australia from forestry, agriculture and urban/industrial residues, while assisting with domestic energy security, job creation essentially in rural areas, and providing various environmental benefits, most notably mitigating carbon dioxide emissions.

Bioenergy Australia is a nation-wide government-industry alliance of more than sixty organisations, established to foster biomass as a source of sustainable energy and for value-added bio-products such as biofuels. Its broad objectives are to:

- Promote an awareness and understanding of the economic, social and environmental attributes of sustainable energy from biomass.
- Broaden the market for biomass by enhancing opportunities, and by helping to reduce financial, regulatory, fuel supply, technical and institutional barriers to enable widespread adoption of biomass energy.
- Facilitate the development and deployment of biomass energy business opportunities and projects through information.

Bioenergy Australia is also the vehicle for Australia's participation in the International Energy Agency's Bioenergy program (www.ieabioenergy.com), an international collaborative RD&D (research, development and demonstration) agreement involving some 23 countries plus the European Commission. The Bioenergy Australia Manager represents Australia on the Executive Committee of IEA Bioenergy, which covers the broad spectrum of bioenergy, including bioelectricity and biofuels. Bioenergy Australia acts as a forum for general and authoritative information dissemination on bioenergy, including drawing on international best practice experiences through its IEA Bioenergy participation.

Please note that this submission does not necessarily reflect the view of individual member organisations.

Below is an overview of biomass and bioenergy; its contribution to global energy production; Australia's biomass resources; the current Australian contribution of bioenergy by type of biomass and by state/territory; the merit of actively managing biomass for energy as opposed to permanent planting for carbon sequestration; coverage of the various bioenergy technologies for power production; greenhouse gas balances aspects; biofuels developments and the opportunity for creating jobs from various bioenergy pathways.

Biomass and Bioenergy

Biomass refers to organic matter, derived in recent times, directly or indirectly, from plants, as a result of the photosynthesis. It includes a wide variety of materials, including forestry residues, waste by-products from wood processing, purpose grown woody energy crops, to woody weeds and urban tree loppings. Bioenergy is the term used to describe energy and energy related products derived from biomass.

Bioenergy can be regarded as a form of solar energy, as photosynthesis combines atmospheric carbon dioxide with water in the presence of sunlight to form the biomass, while also producing oxygen.

The energy bound into the biomass can be recovered through the variety of bioenergy processes and technologies. During the energy recovery process, the carbon dioxide bound in the biomass is released to the atmosphere. Bioenergy is regarded as renewable, when the biomass resource consumed in the energy conversion process is replenished by the growth of an equivalent amount of biomass. Under the Kyoto Protocol bioenergy is regarded as carbon dioxide neutral.

Globally some 220 billion dry tonnes of biomass are produced through photosynthesis per year. The energy stored globally in biomass represents about 0.02% of solar energy incident on earth. This small portion of the absorbed energy is equivalent to approximately eight times the global anthropogenic primary energy consumption of around 400EJ/year.

According to the International Energy Agency's data [1], renewable energy sources provide some 12.7% of the world's total primary energy supply. Of this, some 9.9 percentage points are from renewable combustibles and waste (i.e. biomass). In the OECD countries, renewable combustibles and waste provide 55.7% of the total renewable energy supply. Figure 1 below illustrates the makeup of the nearly ten percent of global primary energy provided by biomass [2]. While two-thirds is non-commercial fuel wood, mainly in developing countries, most of the balance of the biomass used is from the forestry or wood processing sectors in developed countries.

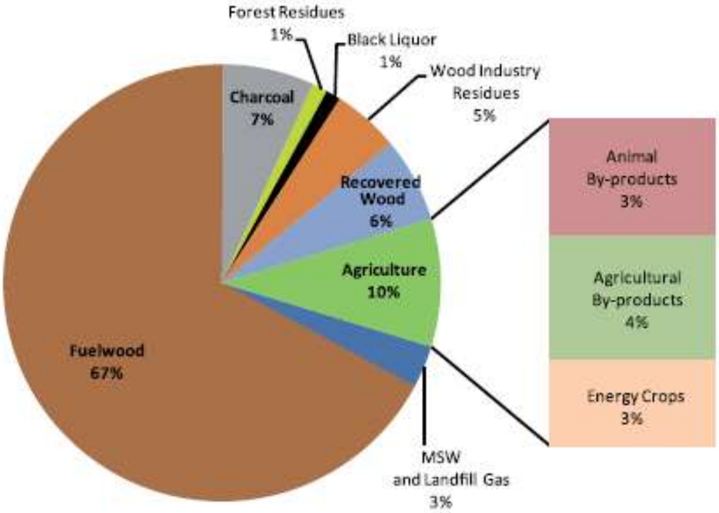


Figure 1: Share of the biomass sources in the primary bioenergy mix. Source: based on data from IPCC, 2007.

Figure 2 shows a table of Australian biomass resources, projected to both 2020 and 2050 from the Clean Energy Council's Bioenergy Roadmap [3].

Biomass Source	**Quantity**	**2010 (GWh/y)**	**2020 (GWh/y)**	**2050 (GWh/y)**
Poultry	94 million	-	297	1055
Cattle – feedlots	870 thousand	-	112	442
Pigs	1.8 million	1	22	205
Dairy cows	1.4 million	-	22	89
Abattoirs	1.3 million tonnes		337	1773
Stubble – grain and cotton crops	24 million tonnes			47000
Bagasse	5 million tonnes	1200	3000	4600
Sugar cane trash, tops and leaves	4 million tonnes	-	165	3200
Oil mallee Eucalypts	-	-	112	484
Camphor laurel			83	20
Forest residues (native forests, plantations, processing residues)	~ 9 million tonnes	79	2442	4554
Black liquor	-	285	365	365
Other pulp and paper wastes	-	74	141	141
Urban food Wastes	2.9 million tonnes	29	267	754
Garden organics	2.3 million tonnes	29	121	461
Urban paper and cardboard	2.3 million tonnes	-	38	1749
Urban wood/timber wastes	1.6 million tonnes	45	295	1366
Landfill gas		772	1880	3420
Sewage gas		57	901	929

Source: Clean Energy Council, 2008

Figure 2: Biomass Resources and Bioenergy Generation Potential - Source: Clean Energy Council, 2008

Figure 2 took a conservative approach to estimating future biomass resources. None-the-less Figure 2 illustrates that there is considerable potential for generating stationary energy (heat and power) from forest based industry wastes and oil mallee energy crops.

Subsequent research by the Future Farm Industries CRC [4] has indentified a large potential for coppiced mallee as a feedstock for bioenergy (heat, power, fuels). The FFI CRC studies predict biomass production from woody crops utilising surplus and degraded agricultural land could also provide environmental benefit. At a biomass price of \$35/t (green) and a water use efficiency of 1.8 dry g/kg of water, they model that profitable woody crops could produce <u>39</u>

million tonnes/annum of dry biomass from 1.5% of farmland in a 300-400mm rainfall zone, and 8% of farmland in a 401–600 mm rainfall zone.

Figure 3 shows Australian bioelectricity generation in 2009 [5]. Wood waste amounts to 73MW. This is overshadowed by bagasse and biogas energy production. As can be seen, the Northern Territory has been slow to take on the production of bioelectricity.

	Biogas	**Bagasse**	**Wood Waste**	**Other bioenergy**	**Total bioenergy**
New South Wales (incl ACT)	73	81	42	3	199
Victoria	80	0	0	34	114
Queensland	19	377	15	4	415
South Australia	22	0	10	0	32
Western Australia	27	6	6	63	102
Tasmania	4	0	0	0	4
Northern Territory	1	0	0	0	1
Australia	**226**	**464**	**73**	**104**	**867**
Share of total renewable electricity capacity (%)	**2.2**	**4.4**	**0.7**	**1.0**	**8.3**

Figure 3: Australian Bioelectricity Generation (MW) 2009 (source: Geoscience Australia)

It is generally recognised that the use of biomass for industrial heat provides substantial greenhouse gas mitigation, and this type of opportunity should not be overlooked in the Committee’s deliberations. While cogeneration (combined heat and power) is generally preferable to stand alone bioelectricity power plants, such electricity only plants should not be dismissed, especially considering that industrial process heat or residential heating applications may not exist at a particular site. It should also be noted that the Federal Government’s Renewable Energy Target only provides incentives for the electricity, not the heat component of cogeneration.

Biosequestration is exemplified by growing trees as a permanent store of carbon. This is illustrated in Figure 4 below. In this illustration, extracted from the Bioenergy Australia - Rural Industries Research and Development Corporation’s ‘Carbon Trading and Renewable Energy’ report 08/184 (copy of full report attached which forms part of this submission), a stand of trees would grow to maturity over a period of approximately 50 years, with the carbon stock plateauing at around 50 years. The carbon would be stored in both the above ground biomass and the roots and soil.

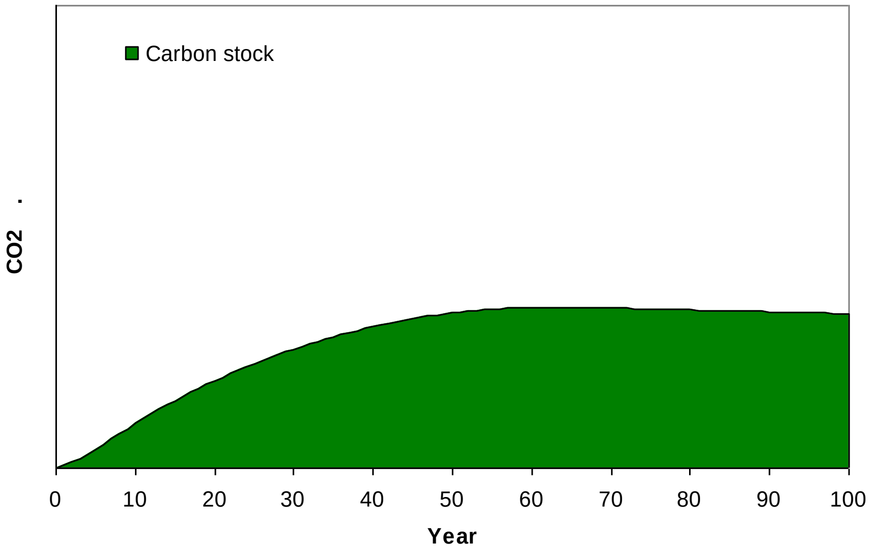


Figure 4: Biosequestration option without active carbon management

An alternative carbon mitigation strategy, involving active management of the stored carbon via bioenergy, is illustrated in Figure 5. In this alternative, the stand of trees (an energy crop) is harvested approximately every 15 years, with the harvested biomass used to offset fossil fuel (for heat, power and/or biofuels). The yellow area under the upper trajectory would be the cumulative carbon offset, while the dark green area represents the carbon stock. In this illustration the dark green area would include both above ground and below ground stored carbon.

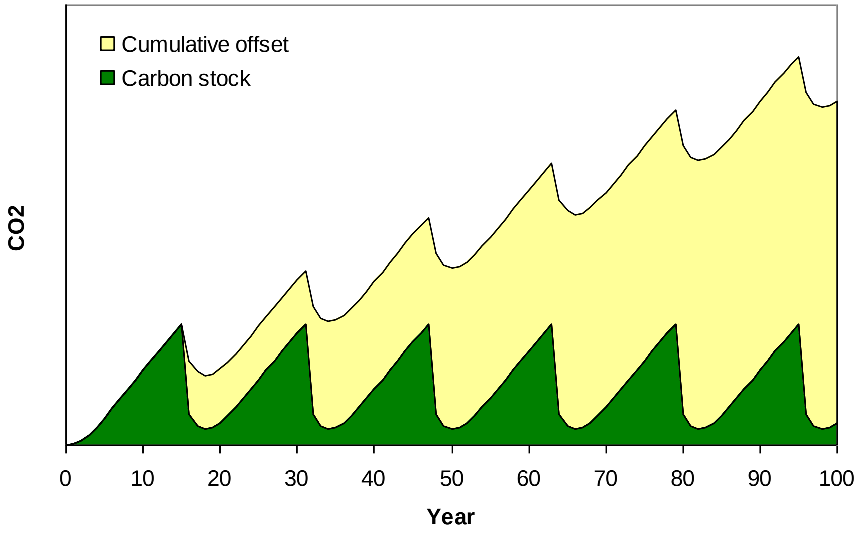


Figure 5: Biosequestration option with active carbon management via bioenergy

It is very much in the national interest that the bioenergy alternative represented in Figure 5 be recognised, for instance under the Government's Carbon Farming Initiative (possibly to be renamed by the new Federal Coalition government), allowing credit for the standing biomass and subsurface carbon. This alternative may relate to short rotation, coppiced energy crops (where the trees are coppiced – cut off at ground level) every three to five years, with regrowth of the trees from the same root stock, or longer term plantation forestry established as an energy crop on a longer cycle, possibly involving digging up the roots. It is suggested that the CFI be integrated with biomass energy cropping to cater for the ongoing harvesting of a proportion of the crop.

Active management of carbon, as illustrated in Figure 5 needs to be recognised for both the displacement of fossil fuel use, and for simultaneous carbon sequestration.

Converting the forestry biomass can utilise a variety of paths and technologies. The primary conversion processes are via thermal, biochemical or mechanical/physical processing.

Figure 6 illustrates the range of energy processing paths for converting biomass to energy, chemical feedstocks and liquid biofuels. These are briefly explained below, coupled with providing examples of the commercial status of several bioenergy technologies.

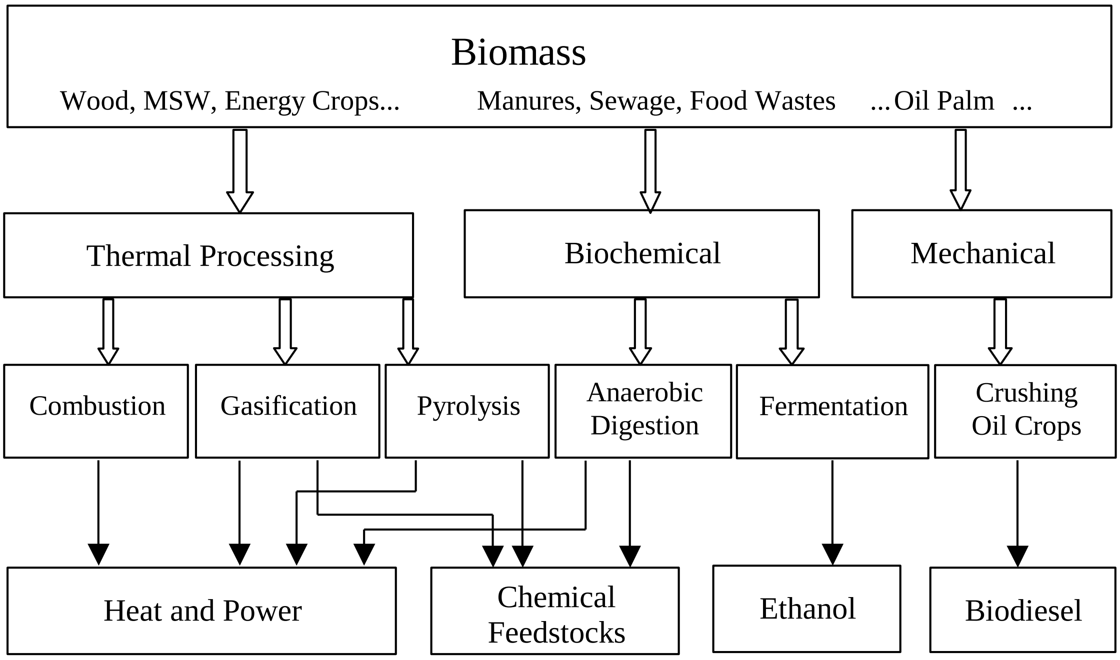


Figure 6: Bioenergy Conversion Routes

Thermal (or thermo-chemical) energy conversion is generally applicable to drier biomass, such as wood and agricultural wastes. The most familiar and commercially mature form of thermal energy conversion is combustion.

Combustion of biomass accounts for approximately 90 percent of the 73,000 MW of modern bioelectricity power plants world-wide, and is very similar to technology applied to solid fossil fuels such as coal. Excess air is applied for the combustion process to convert the biomass essentially to carbon dioxide and water vapour, liberating the stored energy in the biomass. Besides direct combustion, biomass can be co-combusted with coal in utility boilers. Co-firing of biomass with coal is allowable under Australia’s Renewable Energy Target (RET), if the biomass source itself complies with the relevant Regulation administered by the Office of the Renewable Energy Regulator. Combustion technologies are mature technologies and have some advantages in terms of a low technological risk and cost.

Examples of biomass combustion plants are the bagasse fired plants in the sugar industry, where for instance the Pioneer Mill in Queensland has 68MW of electrical generation. Other examples are the Rocky Point Sugar Mill cogeneration plant of 30 MW electrical capacity, and two 30MW plants recently commissioned at the Condong and Broadwater sugar mills on the NSW north coast. Co-firing has also been conducted at various Australian power stations, such as Liddell, Wallerawang, Muja power stations.

It is recognised that power in the Northern Territory is not generated by large thermal power stations based on coal, but this does not preclude the use of smaller bioenergy power plants of various scales.

As an overseas example of a typical combustion bioenergy plant, Figure 7 shows an aerial photograph of the 36 MW Greyling Power Station in Michigan, USA. This plant operates on wood waste with steam conditions 510°C and 8.8 MPa.

Figure 7: 36.2 MW Grayling Power Station in USA (photo NREL)

The Cuijk Fluidised Bed Combustor (FBC) power plant in The Netherlands near the German border is a prime example of this technology. This 25 MW_e wood-chip plant has a steam temperature of 525 °C and a pressure of 10 MPa. Figure 8 provides an aerial view of the Cuijk FBC plant. The two round buildings with conical roofs in the foreground provide covered fuel storage. Fuel is supplied by road and by barge. The plant uses dry cooling to condense the steam. As such, this plant uses minimal amounts of cooling water.

Figure 8: Aerial Photo of Cuijk 25 MW power plant (source Essent Energy)

One of the world's largest biomass boilers is at the Alholmens Kraft Power Plant on the west coast of Finland. The boiler has a capacity of 550 MW_{th} and an electrical capacity of 240 MW_e. This sophisticated plant incorporates reheating of the steam with superheater steam conditions being 545°C and 16.5 MPa, with reheat steam conditions being 545°C and 16.5 MPa. This power plant is in part supplied by slash bundle (tree harvesting logging waste) biomass railed to the power plant. Figure 9 provides an aerial view of the plant, with the 'slash' bundles at the bottom right of the photo.

(source: VTT)

Figure 9: Alholmens Kraft Bioenergy Plant in Finland

Figure 10 shows the turbine hall with the 240 MW steam turbo-generator.

(source: VTT)

Figure 10: Alholmens Kraft Turbine Hall Showing 240 MW Steam Turbo-Generator

A recent trend in some parts of the world is to use multifuel combustion energy plants, including use of biomass fuels. A prime example is the Avedore 2 Combined Heat and Power (CHP) plant located just outside of Copenhagen, Denmark. This power plant opened in mid 2002. It is has a multifuel capability, using both solid biofuels and natural gas. The biomass fuel consists of straw bales (200,000 tonnes per year) and wood pellets (300,000 tonnes per annum). The plant has an ultra super critical boiler with the steam conditions being 580-600°C and 300 bar (very similar to the Tarong North coal fired power station in Queensland). The overall plant efficiency is some 94% in combined heat and power mode. The pellets are

(source: E2 Energi)

Figure 11: Avedore 2 Bioenergy Power Plant (taller unit)

manufactured at a nearby factory at Køge, mainly using imported logs and some are also imported, mainly from Sweden. The Køge pellet plant consists of 18 pellets presses. The main supplier of the CHP plant was Danish FLS Miljö. The output of the CHP plant is 570 MW_e and 570 MW_{th}. The Avedore 2 unit is shown below (rear and to left) in Figure 11 adjacent to Unit 1 which is coal fired. During the design phase, Unit 2 was converted from coal firing to mainly biomass and natural gas. Biomass at times provides some 70 percent of the fuel energy of this Avedore power plant.

Gasification uses a reduced amount of air or oxygen. In gasification combustible gases are liberated from the biomass, to produce a fuel or chemical feedstock. This gas is rich in carbon monoxide and hydrogen gases and can be used to fuel gas engines, gas turbines, or act as a chemical feedstock for the production of chemicals such as methanol or other synthetic fuels. The product gas is very similar to that produced from coal and reticulated around Australian cities before the advent of natural gas.

Biomass gasification is not as mature as combustion technologies, but has been deployed to a limited extent in Australia. For instance Forestry Tasmania has had a small scale wood gasifier accredited by the Clean Energy Regulator (formerly ORER) fuelling a compression ignition engine. Overseas in the USA and Europe biomass gasification has reached commercial scale demonstration, with plants having operated in Burlington Vermont, USA, Gussing in Austria, Värnämo in Sweden. These biomass gasifiers are similar in many respects to gasifiers already used commercially in the coal industry.

Pyrolysis of biomass takes two forms, slow pyrolysis as traditionally applied to charcoal making, or fast pyrolysis (flash pyrolysis), which mainly produces a combustible liquid fuel which can substitute for diesel or act as a chemical feedstock. Fast pyrolysis can convert up to 75% of the mass of the dry biomass to bio-oil. Pyrolysis occurs in the absence of oxygen under controlled conditions. Pyrolysis bio-oil is quite different to petroleum diesel, having a much higher specific gravity (1.2) and other physical and chemical properties. Bio-oil has approximately 60 percent the energy density of diesel on a volume for volume basis, and has been developed to the stage where a number of commercial plants have operated for many years in North America. Several groups are now commercialising technology to upgrade the pyrolysis oil to “drop in” transport fuels. The world’s largest pyrolysis fuels plant recently began operation in the USA. The KiOR plant (see Figure 12) is sized to process some 450 dry tonne per day of wood feed and makes diesel and other fuels.

Figure 12: KiOR plant in Mississipi (source: KiOR)

Australian companies such as Pacific Pyrolysis and Crucible Carbon are now developing slow pyrolysis technologies for the co-production of biochar and energy applications (mainly power). Biochar is seen as a means for sequestering carbon, while simultaneously providing a soil amendment to improve soil health and productivity.

Biochemical conversion of biomass uses microbes to convert the biomass into energy related intermediate products such as methane or ethanol. A common example of biochemical conversion occurs in landfills, where anaerobic organisms convert garbage into a mixture of methane and carbon dioxide, in roughly equal proportions. Often this combustible gas is captured and used for producing electricity in gas engines or turbines driving alternators. This technology is more attuned to wet wastes, with limited application for the forestry industry.

Some aspect of bioenergy that are worthy of note are:

- Bioenergy has an advantage over other forms of renewable energy such as wind and direct solar energy. As the energy bound into the biomass provides inherent energy storage, bioelectricity can be dispatched, providing firm capacity, unlike some other sources dispatched by nature. Additional energy storage is therefore not required for bioenergy. This allows excellent utilisation of the bioenergy plant’s capacity. Many of the newer bioenergy plants have capacity factors in excess of 90 percent, on a par with coal fired units.
- Besides greenhouse gas abatement, a benefit of bioenergy that is of considerable interest in Australia is the combating of dryland salinity and soil erosion. Tree crops can provide the multiple benefit of providing landscape solutions in degraded landscapes as well as providing fuel for bioenergy. The Australian Conservation Foundation (ACF) produced a report ‘Fuelling Landscape Repair’ noting the merit of planting trees to rehabilitate land, and also providing an energy feedstock.
- There are employment opportunities from the ongoing requirement to source and provide fuel for the life of a bioenergy project (a 30 MW bioelectricity plant would require close to 300,000 tonnes of biomass per year). An assessment by IEA Bioenergy [6] indicates an employment level of some 180-500 person-years/TWh of fuel energy.
- Bioenergy was providing approximately 25% of surrendered Renewable Energy Certificates (RECs) under the MRET scheme, until the introduction of highly subsidised

roof top solar photovoltaic and solar hot water systems distorted this scheme, which has now been split into the Large-Scale Renewable Energy Target and the Small-Scale Renewable Energy Scheme.

Greenhouse Gas Balances of Bioenergy Systems

Life cycle analysis applies a methodical ‘cradle-to-grave’ assessment of a technology, within pre-defined system boundaries to assess the particular technology’s use of resources for its manufacture, use and eventual decommissioning. This assessment is generally applied to inputs as well as outputs associated with the technology. Of particular interest for various energy technologies are the life cycle emissions of ‘carbon dioxide equivalent’ gases.

Figure 13 shows the results from a UK Department of Trade and Industry study [7], partially based on an IEA study, comparing the life cycle emissions of carbon dioxide for various conventional and renewable energy technologies. On a life cycle basis, greenhouse gas emissions of bioenergy systems are project specific, but typically in the range 4-50 grams CO_2 equivalent/kWh. By comparison, photovoltaic technology is reported in this study at over 150 grams CO_2 equivalent/kWh. It is recognised that such life cycle analyses are not definitive, but this does highlight the need to consider greenhouse gas emissions during operation and also over the technologies’ whole life span.

Technology	**g/kWh CO_2**
Brown Coal: Current Practice	1100-1300
Bituminous Coal: Best Practice	955
Gas: Combined cycle	446
Diesel: Embedded	772
Onshore wind	9
Hydro - existing large	32
Hydro – small-scale	5
Decentralised photovoltaic (PV)- retrofit	160
Decentralised PV – new houses	178
Decentralised PV – new commercial	154
Bioenergy Technologies	
Bioenergy – poultry litter - gasification	8
Bioenergy – poultry litter – steam cycle	10
Bioenergy – straw – steam cycle	13
Bioenergy –straw - pyrolysis	11
Bioenergy – energy crops - gasification	14
Bioenergy – Forestry residues – steam cycle	29
Bioenergy – Forestry residues - gasification	24
Bioenergy – animal slurry – anaerobic digestion	31
Landfill gas	49
Sewage gas	4

Figure 13: Life Cycle Carbon Dioxide Equivalent Emissions for various technologies (g/kWh) (adapted from [7]).

Industry Issues

The Committee should be aware that there are a number of bioenergy projects that have not as yet gone ahead for a variety of reasons, mainly due to the low and uncertain market for bioenergy and also difficulties and cost associated with fuel supply. This could be redressed by the Northern Territory providing a feed-in tariff tailored for bioenergy at its various scales.

The Committee's attention is also drawn to a major publication produced by Bioenergy Australia, available on its website, entitled 'Bioenergy Production in Australia – status and opportunities' which may provide the Committee with added information of the prospects for bioenergy in the Northern Territory.

Biofuels

The present generation of Australian biofuels are largely based on ethanol and biodiesel, which provide under one percent of current fuel requirements in Australia. In Australia ethanol is currently produced from starch wastes, molasses and sorghum grain, while biodiesel is mainly produced from waste vegetable oil, tallow and some virgin plant oils.

New technologies for producing biofuels are being developed world wide. In addition to drop-in hydrocarbon fuels from fast pyrolysis (mentioned above), technologies now being operated or built at commercial scale include:

- Straw and wood to ethanol via fermentation, for example the plant illustrated in Figure 14, operated by Beta Renewables at Crescentino in Italy:

Figure 14: Beta Renewables Ethanol Plant in Crescentino, Italy

- Wood waste to ethanol via gasification, for example the plant illustrated in Figure 15, operated by Ineos Bio in Florida, USA.

Figure 15: Wood Waste to Ethanol via Gasification

- MSW to ethanol via gasification, for example the plant illustrated in Figure 16, being built by Enerkem in Alberta, Canada

Figure 16: Enerkem MSW to Ethanol Plant in Alberta Canada

Other groups such as Gevo, Byogy and Swedish Biofuels are developing technologies to convert ethanol to hydrocarbons that may be blended seamlessly with petrol, diesel and jet fuel.

These commercial technologies have been developed by international groups with significant engineering capability and the ability to license their technologies into Australia. At the pre-commercial level, exciting and innovative work is underway in Australia on new technologies, such as using hot, compressed water to convert biomass to a bio-crude feed for oil refineries (by Licella in NSW). A number of Australian groups have algal fuel projects at the pre-commercial stage, with interesting demonstration plants being built in WA and Queensland. These algal plants seek to produce biodiesel as well as other, value-added products.

While ethanol and hydrocarbon biofuels are well understood and in growing use world wide there is also interest in fuels such as methanol, DME (dimethyl ether) and hydrogen. Volvo in Sweden is developing Dimethyl Ether (DME) as a transport fuel. DME is similarly derived from biomass gasification, having properties not too dissimilar to LPG. The photo below in Figure 17 shows a Volvo DME truck being displayed at a biofuels conference in Stockholm.

(source: S Schuck)

Figure 17: Dimethyl Ether (DME) Truck on Display

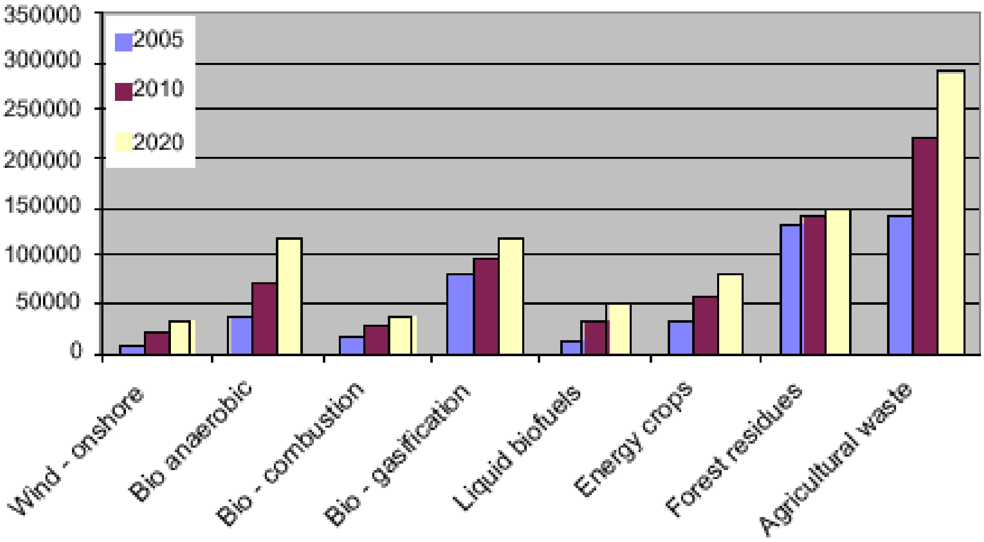
Bioenergy Australia is the vehicle for Australia's participation in the International Energy Agency's Bioenergy Program (www.ieabioenergy.com). It is currently participating in four Tasks:
Task 38 *Climate Change Effects of Biomass and Bioenergy Systems*
Task 39 *Commercialisation of Conventional and Advanced Liquid Biofuels from Biomass*
Task 42 *Biorefining - Sustainable Processing of Biomass into a Spectrum of Marketable Bio-based Products and Bioenergy*
Task 43 *Biomass Feedstocks for Energy Markets*.

Such participation is exposing Members of Bioenergy Australia to the latest developments in bioenergy and contributes to the development of alternatives to fossil fuels.

Energy crops using tree species could provide the feedstocks for substantial biofuel industries (noting the above developments). Another opportunity is to use invasive weeds such as *Mimosa pigra* and *Acacia nilotica*, prevalent in the Northern Territory for fuel and feedstocks. Such industries, besides contributing to our future fuel mix and energy security, would stimulate rural economies and provide permanent jobs through the production of the biomass and the supply logistics.

Job Creation

Bioenergy is known to have impressive economic multipliers, translating into employment opportunities, especially in rural and regional areas. Figure 18 from a European Union study shows the impressive job creation potential of bioenergy.



Projected employment in the EU for biomass technologies. Wind is included for comparison.
Source: EU Altener Report: Impact of RES on Employment, 2000.

Figure 18: Employment from Bioenergy Technologies

Conclusion

The bioenergy opportunity has not been realised to in Australia to the same extent as in North America and Europe. Various studies have shown that bioenergy could provide a substantial proportion of Australia's stationary and liquid fuels needs. This submission has been provided to bring to the Committee's attention what has and is being achieved overseas in this area, and what could be achieved in Australia and the Northern Territory.

I would like to point out that the Northern Territory is not represented on Bioenergy Australia, and we hope for some level of engagement in the future so that the extensive communication and information sharing that we undertake is made fully available to the NT government.

Thank you for the opportunity of providing this submission. I would be most pleased to provide follow-up information and assistance to the Committee. This would hopefully lead to bioenergy opportunities contributing to generation mix and future fuel supplies in the Northern Territory, together with the jobs and sustainable economic development that are unique to this well-established form of renewable energy.

Yours Sincerely

S. Schuck

Dr Stephen Schuck
Bioenergy Australia Manager

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Attachment:

- 'Carbon Trading and Renewable Energy' Bioenergy Australia and RIRDC publication 08/184 (electronic copy in pdf format)