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BIOENERGY AUSTRALIA SUBMISSION

20-year Waste and Resource Recovery Strategy

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The purpose of this submission from Bioenergy Australia is to highlight how waste to energy technologies can play a significant role in achieving a sustainable waste and resource recovery industry in NSW.

About Bioenergy Australia

Bioenergy Australia is the National Industry association, committed to accelerating Australia's bio economy.

Our mission is to foster the bioenergy sector to generate jobs, secure investment, maximise the value of local resources, minimise waste and environmental impact, and develop and promote national bioenergy expertise into international markets.

Bioenergy Australia's objectives are to:

Advocate **-** With our members, we anticipate and develop leading positions on issues of concern to the advancement and growth of bioenergy in Australia.

Campaign **-** We raise the profile of the industry within the media and broader community to achieve a greater level of understanding about bioenergy and the vital role it must play to achieve carbon neutrality by 2050.

Inform **-** We publish reports, webinars and articles to help our members keep ahead of industry trends and opportunities. We also manage the Biomass Producer website, an AgriFutures Australia resource showcasing Australian bioenergy projects, expertise, and identifying opportunities for primary producers.

Connect **-** We facilitate knowledge exchange and networking for members through task-specific meetings, our Annual Conference, and Webinars. We link investors with emerging businesses; researchers with technology developers; government with innovators. We also administer Australia's participation in IEA Bioenergy. Our Industry groups bring together specialists in specific fields

1. **What are the key issues facing the NSW waste system?**

NSW is facing a waste crisis as landfills prepare for a significant increase in waste directed to landfill in the absence of any strategic alternative. Contributing to the expected jump in landfill waste are China's "National Sword" waste import ban, Sydney's construction boom and the introduction of a landfill levy in Queensland. Queensland has been taking about 800,000 tonnes annually of NSW detritus.

As landfills reach capacity in NSW, and waste disposal costs soar, energy from waste (EfW) technologies represent an attractive option to turn non-recyclable waste streams into higher-value products.

EfW Technologies overseas are proven and implemented internationally. The NSW planning legal framework sets out a very clear pathway for proponents to carry out their environmental assessment documentation to obtain the right approvals and licence from the NSW Environment Protection Authority, however the development of this industry has been delayed in NSW because of the lack of a clear government policy.

The regulators need to clearly understand where EfW sits on the waste hierarchy and support its role in recovering embodies energy from materials which cannot be reused or recycled and would otherwise go to landfill for disposal.

2. **What are the main barriers to improving the NSW waste system?**

Barriers to improving the NSW waste system include (with a specific focus on EfW):

- lack of functioning EfW policy and government support for EfW as preferential to landfill
- lack of education and understanding within government departments, policy makers and the public on the various types of technology and product outputs available
- lack of policy certainty given recent handling of the municipal organics policy issues
- lack of financial incentives to the utilisation of waste rather than just disincentivising landfill
- inadequate allocation of funding derived from landfill levies
- poor management of infrastructure
- lack of personal responsibility and accountability for individuals and businesses in waste avoidance, careful consumption and collective accountability for environmental matters.

3. **How can we best reduce waste?**

With a focus on organic waste, Bioenergy Australia suggests the following actions:

- Reduce the amount of organics going to landfill – potentially a further levy or ban
- Support separate organics collection
- Reduce barriers to the utilisation of digestate from biodigestion

4. **How can we recycle better?**

The process of Recycling, converting waste into new materials, is critical to the circular economy and includes the conversion of biodegradable waste into useful materials. To recycle better we should look

not just at how to divert waste from landfill but how to make best use of the material. For example, the compositing of organic material can create a fertilizer which can prevent it from going to landfill, however if we take that same material and process it in a biodigester it is converted into a better fertilizer and energy in the form of biogas. Disincentives to landfill, such as a levy, only prevent the worst path for that material and does not drive a circular economy which involves capturing the maximum potential of our waste.

Taking this approach, we would not just look at what we are diverting from landfill but all the potential 'waste' that could be utilized, for example farm waste is often spread on fields or degrades locally resulting in carbon emissions. The potential of this 'waste' is not being utilized and could be converted through biodigestion into fertilizer for local use and energy as biogas. While there is often not a sufficient need for this energy locally, we could take a lead from countries like Germany that upgrades this biogas to biomethane and injects it into the gas network. This renewable energy can then be sold to any gas customer across NSW to decarbonize their energy supply while providing value back to the region where the gas was created.

5. What are the main opportunities for improving the NSW waste system?

In order to improve the NSW waste system, Bioenergy Australia strongly supports NSW transitioning to a more **circular economy**, which is an alternative to a traditional linear economy (make, use, dispose) as it is restorative and regenerative by design. It aims to keep resources in use for as long as possible, extract the maximum value from them while in use, then recover and regenerate products and materials at the end of each service life.

In particular, Bioenergy Australia invites the NSW Government to consider the role of a potential **bio-economy** in the transition to a circular economy. A bio-economy is circular by nature as it regenerates CO2 and uses renewable raw materials to make greener everyday products. In fact, bio-based products and materials have the benefit of achieving a more balanced carbon cycle in comparison to fossil alternatives. The bioeconomy encompasses the conversion of renewable biological resources into high-value products and chemical building blocks, fuels, power and heating via mature or innovative technologies. Therefore, a bio-economy can significantly contribute to the circular economy by being a supplier of renewable energy (primary sources + side streams), materials that can be well cascaded (wood, fibres) and even feedstock for plastics.

A circular economy solution is consistent with the **waste management hierarchy**, which shows the interrelationship between recycling and recovery of energy, and the preference of recovering products, materials or energy from waste instead of disposal of waste into landfill, as shown in Figure 1.

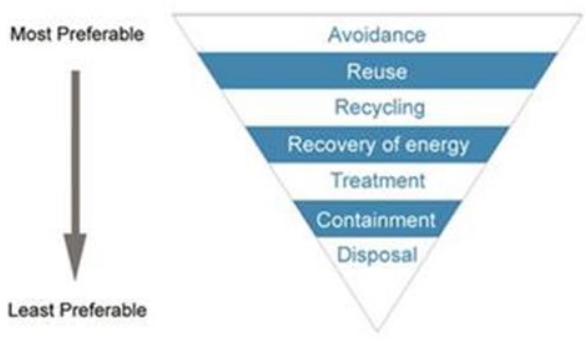


Figure 1. Waste management hierarchy.

It is important to recognise that, in accordance with the waste hierarchy, wastes should be recovered for their highest order use wherever it is economically feasible to do so. The utilisation of residual wastes for bioenergy production is a preferable alternative to landfilling of these wastes, therefore **Energy from Waste (EfW)** technologies can play a significant role in the NSW waste system.

The scope of the term Energy from Waste is broad, encompassing a range of thermal, biological and chemical processes. These include mature technologies, including combustion for heat and power, anaerobic digestion to generate biogas, and emerging technologies, such as those based on conversion of mixed sugars derived from waste into biofuels, fast pyrolysis, hydrothermal liquefaction (HTL) and gasification. These technologies allow waste to be converted to other energy products, such as gas or liquid fuels, waxes, residual products such as bitumen, feedstocks to make new chemicals and plastics, and hydrogen (which is rapidly emerging as an energy vector in power, transport, and industrial sectors).

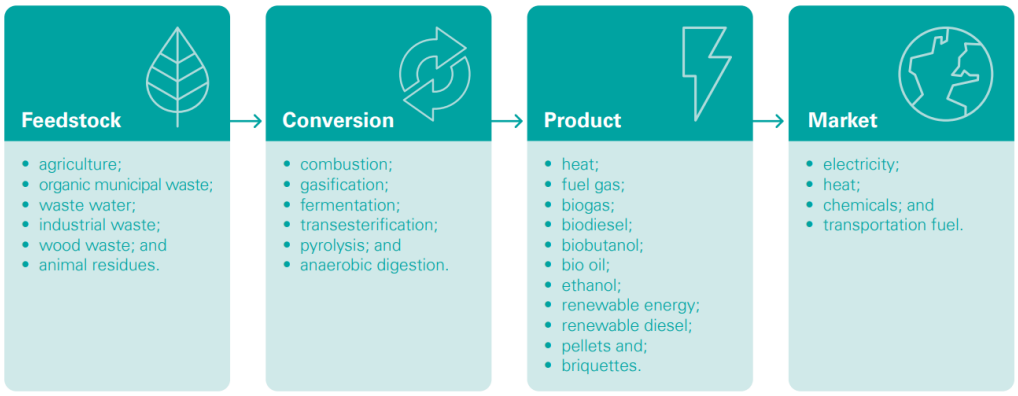
Waste streams and opportunities

We encourage the department to look at waste streams not as an issue but a resource/opportunity.

As illustrated in the Bioenergy state of the nation report, bioenergy can be produced from a range of biomass sources, including agricultural products, local council (municipal) waste and landfill gas. Biomass is converted to end-use products through the use of a number of conversion technologies.

Figure 2: Biomass fuel sources

Figure 3: Biomass to bioenergy process



Among others, the recovery of food waste presents a significant opportunity for NSW and future efforts should minimise the disposal of this waste to landfill. In NSW, food waste is the second largest commercial and industry waste – amounting to over 300,000 tonnes in Sydney alone. In addition, more than 800,000 tonnes of food waste are thrown out by NSW households every year. In dollar

terms, the state's waste amounts to $10 billion, or $3800 per household. Instead of being thrown out, food waste could be converted into biogas, upgraded into biomethane and injected into the gas network. This would decarbonize the gas supply for 300 000 households, while producing fertilizer for farms, supporting the expansion of variable renewable electricity and capturing precious water.

The method of choice to treat and recover food waste in a circular economy is anaerobic digestion (AD). Food waste digestion can play a central role in the transition of NSW to a more circular economy, with particular importance not only due to its potential to produce biogas, but also because of its ability to capture nutrients and return these to the agricultural production system. More information about the role of food waste digestion in a circular economy can be found in the IEA report "Anaerobic Digestion of Food Waste for a Circular Economy".

For anaerobic digestion to be utilised as an effective waste management, emissions reduction and energy production solution in NSW, it is imperative that there is a stronger focus on the separation of organics, and specifically food waste at the household. In the event that food waste is mixed with other waste streams in the general waste bin, it is more difficult to be utilised for anaerobic digestion due to the containments and the economic feasibility of sorting the waste. Bioenergy advises the NSW Government that this will require the food waste to be collected in a separate bin, as does happen in many European countries.

By using waste locally produced as inputs and generating biogas and digestate as outputs, the overall biogas value chain is representative of the circular economy concept. Biogas is in fact a proven technology, which is widely adopted internationally. Global production of biogas accumulated to 352 TWh (1.27 EJ) in 2014, representing about 1.5 per cent of the global renewable energy supply. The biogas market in Europe, the leader in terms of production, has experienced a strong growth: between 2009 and 2015, the number of installations almost tripled. Out of the 17,662 biogas plants in Europe, Germany is home to 10,431 plants, accounting for more than 50 per cent of the biogas production in the region. The United States (US) is another major biogas producer. The US biogas market saw 2,200 biogas units in 2017. According to the American Biogas Council, the construction and operation of biogas plants in 2016 may have supported around 7,000 jobs.

The recently launched report "Biogas opportunities for Australia", prepared by ENEA consulting for Bioenergy Australia, ARENA, the International Energy Agency, CEFC and Energy Networks estimated biogas potential in Australia is 103 TWh (371 PJ), which is comparable with current biogas production in Germany. Australia's biogas potential is equivalent to almost 9 per cent of Australia's total energy consumption of 4,247 PJ in 2016-2017. Considering the current average size of biogas units in Australia, this could represent up to 90,000 biogas units. Moreover, the investment opportunity for new bioenergy and energy from waste projects is estimated at $A3.5 to 5.0 billion, with the potential to avoid up to 9 million tonnes of CO2e emissions each year.

Biogas generated from decomposition of organic matter can be upgraded to biomethane and injected into the gas grid or be converted into electricity to feed the electrical grid. According to the Deloitte report "Decarbonising Australia's gas distribution networks", biogas is currently the cheapest option for decarbonisation of energy currently provided by gas networks. Current policies such as the Renewable Energy Target (RET) favour the use of biogas for electricity generation rather than injection into the gas network, however enough biogas potential exists to meet all residential and commercial gas demand on the East Coast. The cheapest form of biogas feedstock (urban waste, livestock residue and food waste), is currently sufficient to meet around 14% of energy used from gas.

Other waste streams – waste-to-fuel technologies

Following alarming reports regarding Australia's low emergency fuel reserves and always stricter emission reduction targets in the transport sector, the industry is looking into opportunities to use domestic waste to produce sustainable fuels.

Technologies are constantly under development to optimise the conversion of a broad range of waste biomass into liquid and solid biofuels. Some examples are the Australian technology developer Licella, Mercurius Australia teamed up with Southern Oil Refining, Global Ecofuels Solutions (GEFS) in conjunction with Boral Australia, and the leading Australian company ResourceCo in a joint venture with Cleanaway.

Licella has recently formed a Joint Venture in Australia, iQ Renew, to construct an end of life waste to fuels plant in Australia that will be able to produce low sulphur fuels for the Australian shipping industry. This follows on from their announcement of collaboration with Neste, the world's leading producer of renewable diesel and UK-based chemical recycling company ReNew ELP in a development project to explore the potential of using mixed waste plastic as a raw material for fuels, chemicals, and new plastics.

Mercurius Australia has teamed up with Australian company Southern Oil Refining, as well as MGC from Japan and KOLON from South Korea to further develop its REACH™ technology converting waste biomass (sugarcane bagasse, wood chips) and biogenic MSW into diesel, jet fuel and renewable chemicals and plastics. Southern Oil Refining is Australia's leading producer of recycled fuels and owner/operator of Australia's only biofuels testing refinery located at Yarwun QLD. Southern Oil have successfully refined a number of post-consumer waste feedstocks into 100 per cent drop-in diesel and have successfully conducted large scale pilot tests on its renewable diesel made from old tyres.

Boral Australia is conducting an ARENA funded, feasibility study in the use of GEFS's MECC technology to convert hardwood sawmill residues into renewable diesel. The MECC technology is robust and can utilise agricultural residues and solid municipal organic waste streams such as contaminated paper and plastic.

Last year a new state-of-the-art resource recovery facility at Wetherill Park in Sydney was unveiled – the largest of its kind in Australia. The multi-million-dollar resource recovery plant, developed by leading Australian company ResourceCo, and owned in a joint venture with Asia Pacific's largest waste management, industrial and environmental services company, Cleanaway, directly contributes to shifting Australia to a more sustainable energy model. The plant transforms waste from selected non-recyclable waste streams that would otherwise go into landfill into a baseload energy source, known as Process Engineered Fuel (PEF), while reducing reliance on fossil fuels and greenhouse gas emissions.

Bioenergy Australia recommendations to support EfW industry

Bioenergy Australia has the following recommendations to support value extraction from waste in NSW:

- Greater and more flexible funding from the NSW levy being returned to industry to incentivise landfill diversion.
- Education campaigns designed to educate residents
- Whole of Government coordination and education campaign
- Completion of the stalled Waste and Resource Recovery Infrastructure Strategy to provide certainty to community, industry and investors.

- The creation of a market development agency, similar to Sustainability Victoria and Green Industries South Australia, independent of the EPA.
- An investigation of the viability of providing the EPA with greater powers to manage illegal and unlawful operators.
- The development of a specific Waste and Resource Recovery State and Environmental Planning Policy (SEPP).

Thank you for the opportunity to provide this submission.

Yours sincerely

Shahana McKenzie, CEO Bioenergy Australia