



Produced by GHD  
for Bioenergy Australia



# Turning Circle

How bioenergy can supercharge  
Australia's circular economy

2022



# What is a circular economy?

The aim of a circular economy is to maximise the reuse and recycling of materials and resources.

It is a move away from the conventional linear economy of make, use, dispose, in which we take materials from the earth, make products, then throw them away as waste. The central idea of a circular economy is that the longer material and resources are in use, the more value we can extract from them.

“A circular economy decouples economic activity from the consumption of finite resources. It is a resilient system that is good for business, people and the environment.”

Ellen MacArthur Foundation

## What is bioenergy?

Bioenergy is energy derived from plants, animals, and their by-products and residues. Agriculture, farming, human habitation and forestry generate crop wastes and remains, manures and sludges, rendered animal fats, used oils, and timber residues. These materials are known collectively as “biomass”. Sustainable biomass converted to bioenergy can provide the power for our cities and industries, the liquid fuel for our planes and automobiles; it can heat our showers, and warm and cool our homes.

## What is feedstock?

Feedstock is any renewable, biological material used directly as a fuel, or converted to another form of fuel or energy product.

By shifting from a linear waste management model to a circular economy, Australia can move from being one of the highest per capita waste generators in the world to a recycling and remanufacturing powerhouse.

Bioenergy and bioproducts – renewable energy and material generated from organic materials– are an essential component of a circular economy and can accelerate Australia to a carbon neutral 2050. But we haven't even begun to realise bioenergy's potential here.

We are overdrawing on our world's natural resources and polluting our environment. For a sustainable future, we must move from a linear 'take-make-use-dispose' society to one where resources are kept in circulation for as long as possible and pollution and waste are avoided.

Bioenergy offers a valuable source of renewable electricity, heat, gas and transport fuels to support Australia's industry sectors. It provides direct substitutes for fossil-fuel derived products, and avoids fossil fuel-derived greenhouse gas emissions. Bioenergy generated from biomass, including agricultural and forestry residues, commercial and household food and garden organics, circulates the energy and carbon embodied in those materials. Burning fossil fuels releases carbon that has been locked up in the ground for millions of years, while burning biomass or biomass-derived fuels emits carbon that is part of the biogenic carbon cycle (IEA Bioenergy).

Processes for converting organic materials to provide energy are proven, and in use, here and around the world. For example, in 2019, the World Biogas Association reported that there were already 132,000 small, medium and large-scale anaerobic digesters and 700 upgrading plants operating globally as well as some 50 million micro digesters, with the opportunity for significant further growth.

“Moving to a circular economy, where waste is designed out of the system and resources are valued, will bring down business costs, support new industries and jobs, reduce greenhouse gas emissions and increase efficient use of natural resources such as water and energy.”

Reforms to meet Australia's future infrastructure needs, 2021 Australian Infrastructure Plan, Infrastructure Australia.

In Australia, we have abundant materials suitable for the generation of bioenergy. Bioenergy offers the opportunity to tackle the otherwise hard-to-abate areas including renewable gas grid injection, renewable industrial heat generation and aviation. Its use is currently limited however and new policy settings are essential to unleash this opportunity.

The Australian Renewable Energy Agency's (ARENA) Australia's BioEnergy Roadmap (November 2021) estimates that in a targeted deployment scenario, by the start of the next decade, the country's bioenergy sector could:

**\$10bn**

Contribute about \$10 billion in extra GDP per annum.

**↓9%**

Reduce emissions by about nine per cent.

**26,200+**

Provide 26,200 new jobs.

**↗6%**

Divert an extra six per cent of waste from landfill.



**Enhance fuel security**

“Each tonne of organic waste disposed of as landfill and broken down by anaerobic fermentation releases about one tonne of carbon dioxide equivalents (CO<sub>2</sub>-e) of greenhouse gases, mostly in the form of methane.”

Western Australian Department of Primary Industries and Regional Development

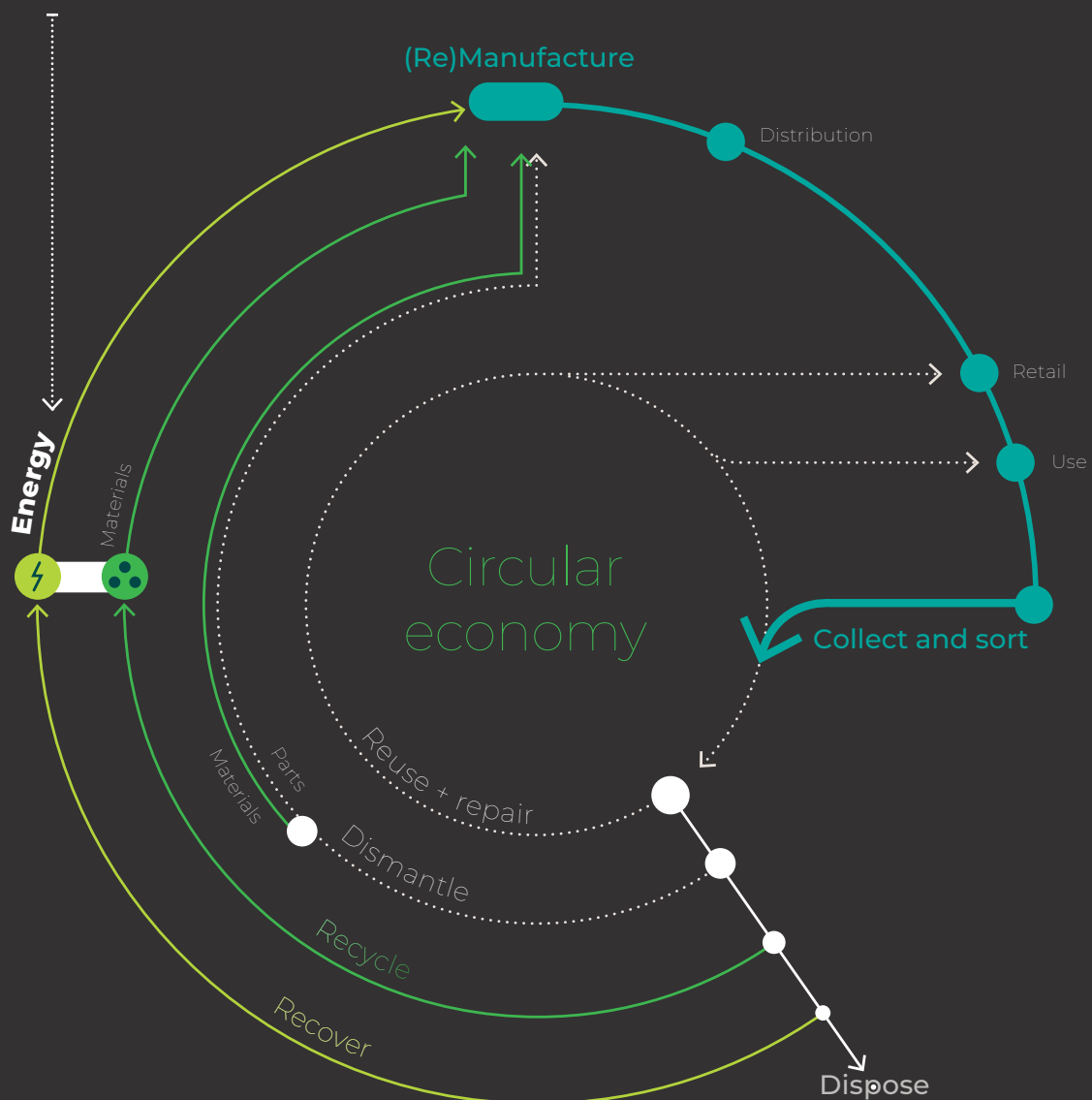
Here we outline bioenergy inputs, processing and products/uses and introduce the key elements needed for Australia to begin realising the immense opportunities in bioenergy that other countries are already taking advantage of.

Bioenergy can support Australia's energy transition, help address greenhouse gas emissions and climate change, and improve the use of our waste. It can give rise to a thriving new economic sector, bringing jobs and industry to Australia's regions and rural communities.

Bioenergy is Australia's untapped renewable energy opportunity.

A circular economy — where waste and pollution is eliminated, resources are circulated and nature is regenerated — necessarily runs on renewable energy. It will benefit all of society, reduce business costs and our impact on the planet.

Bioenergy production supports these principles. It addresses wastage of materials and the impacts of non-biogenic carbon emissions, creating much-needed renewable energy. It has the potential to be a significant part of Australia’s future circular economy.

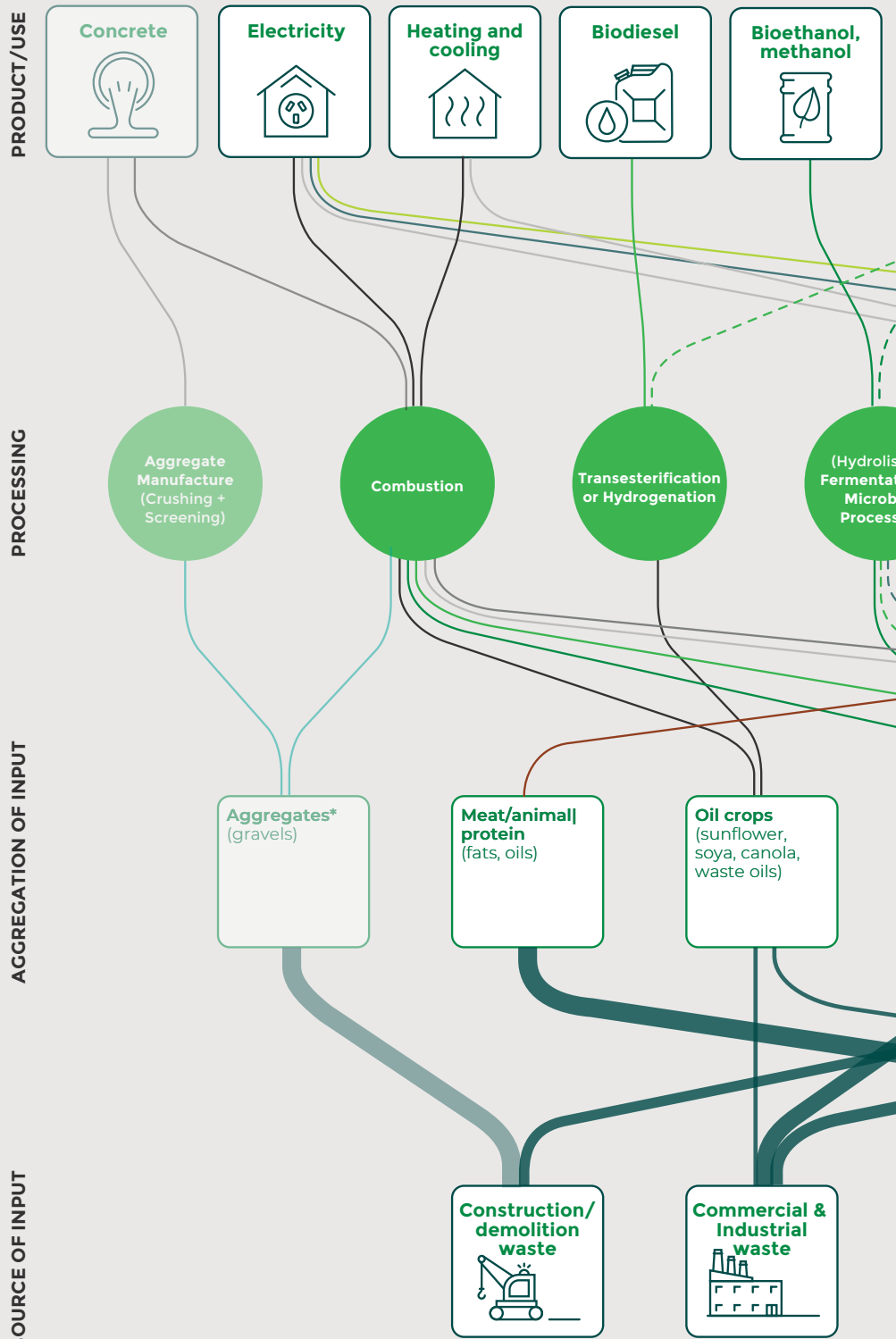
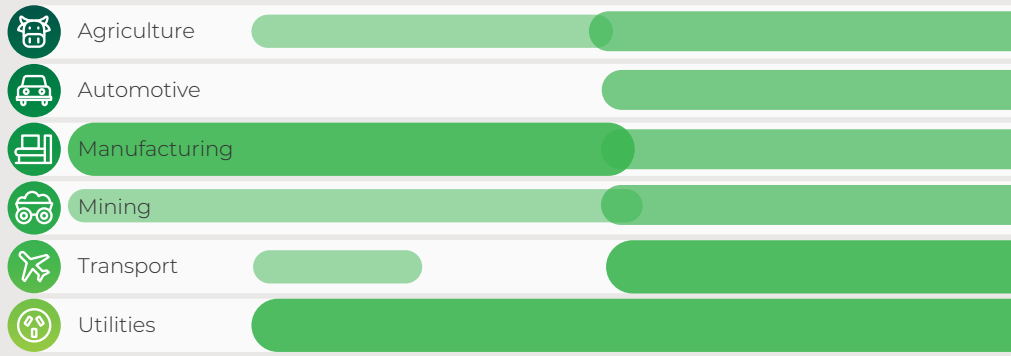


# What is bioenergy?

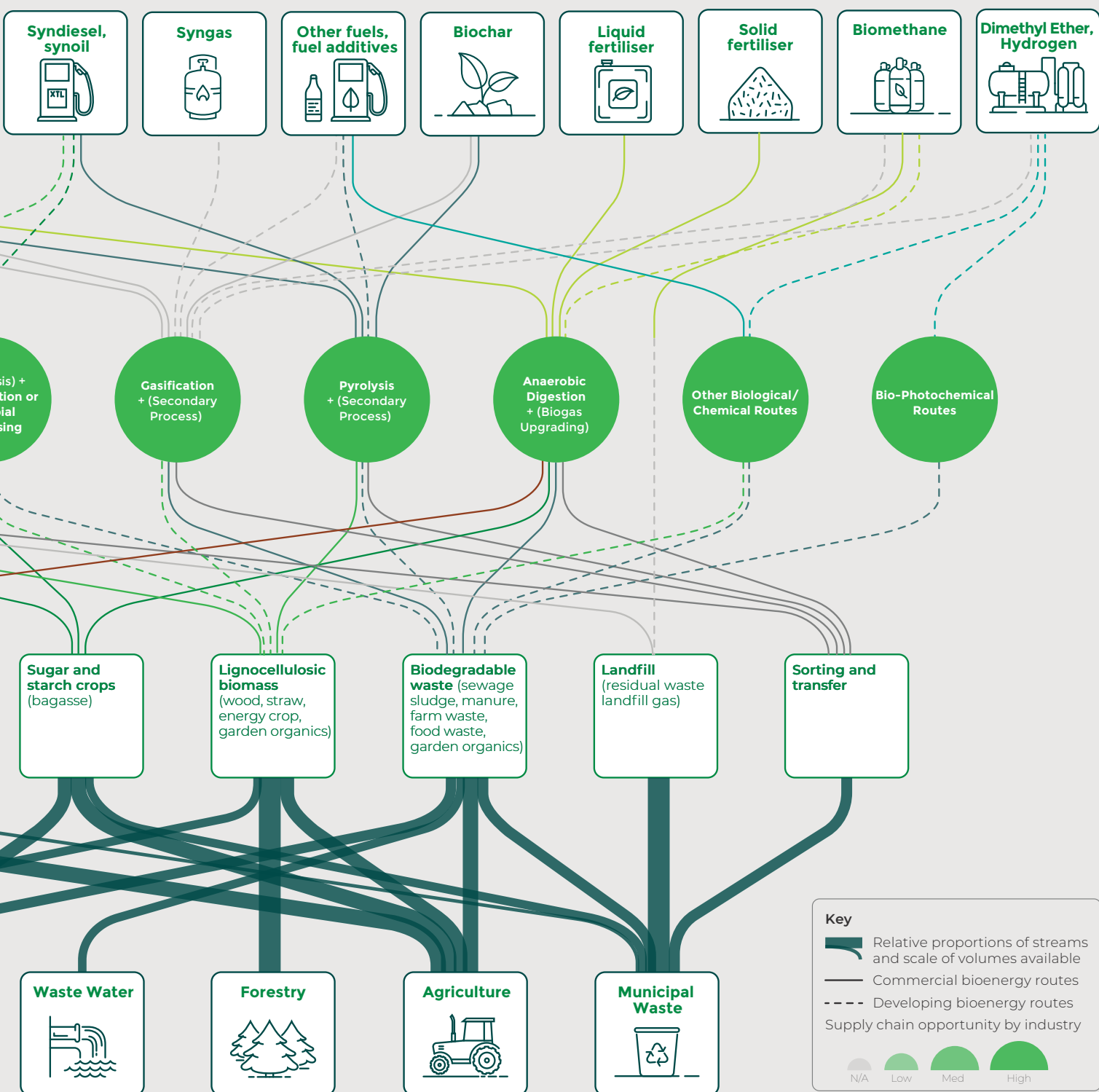
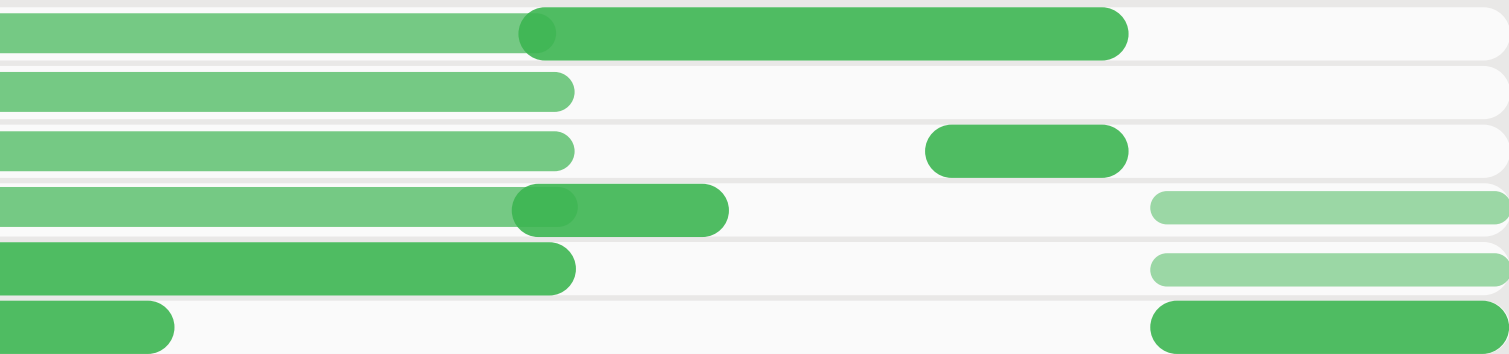
Bioenergy offers a valuable source of renewable electricity, heat, gas and transport fuels to support Australia's industry sectors.

It provides direct substitutes for fossil-fuel derived products and avoids fossil-derived greenhouse gas emissions. Generated from biomass sources like agricultural and forestry residues and wastewater, food or garden matter from households and businesses, bioenergy circulates the energy of materials that would otherwise go to waste, and being derived from organic materials, is renewable.

“Burning fossil fuels releases carbon that has been locked up in the ground for millions of years, while burning biomass or biomass-derived fuels emits carbon that is part of the biogenic carbon cycle.”  
IEA Bioenergy



Schematic view of the variety of commercial (solid lines) and biological conversion routes to heat, power, CHP and transport fuels (dashed lines).  
\* From a bioenergy perspective, aggregates are a co-product.



...es) and developing bioenergy routes (dotted lines) from biomass feedstocks through thermochemical, chemical, biochemical and liquid or gaseous fuels (modified from IEA Bioenergy, 2009).

...product and/or by-product of energy recovery initiatives in the C&D waste subsector, and included here as a supply chain optimisation consideration

# A net zero carbon emissions future for Australia, and the world

As markets change and we push for a sustainable future, we'll see a mix of bioenergy, solar, wind, hydropower, and other renewables coming to the fore of energy supply.

## Bioenergy makes sense, today more than ever

Bioenergy is the renewable source that can replace fossil fuels in all energy markets – gas, heat, electricity and fuel for transport. It is renewable and low carbon. It provides stability through diversity as more distributed sources of energy are introduced.

Bioenergy is a flexible and dispatchable source of energy that can be used to support reliability and security of energy supply.

Sustainable bioenergy is playing a key role in helping the European Union increase energy security and meet ambitious emissions reduction targets.

Significant global investment is driving the development of biofuels to service the aviation, marine and heavy haulage sector. Bioenergy can be a significant growth sector for the Australian economy.

The Australian Bioenergy Roadmap reports Australia could generate up to 559 PJ per annum from bioenergy in total, and see the following progress by the 2030s:

- Gas pipelines incorporating **up to 105 PJ per annum of renewable gas**, used within the existing network and compatible with low emission hydrogen, accounting for **23 percent of the total pipeline gas market**.
- Bioenergy providing up to **244 PJ per annum of renewable industrial heat**, with widespread commercial deployment. This is about **33 per cent of the total industrial heat market**.
- Deployment of **14 TWh per annum of utility-scale and small-scale electricity generation**, demonstrating the value of dispatchability from bioenergy-derived electricity. This would make up **eight per cent of the total utility-scale and small-scale electricity generation market**.
- Early deployment of pre-commercial sustainable aviation fuel (SAF) production plants to establish a viable Australian-based industry, with production of up to **1,908 ML per annum of SAF**, about **18 per cent of the aviation fuel market**.
- **Up to 2,605 ML per annum of road transport biofuels** produced for local consumption, accounting for seven per cent of the total road transport fuel market.

**Dispatchable generation** refers to sources of electricity that can be dispatched on demand at the request of power grid operators, according to market needs.



## All around us: an abundant secure and sustainable energy supply

Biomass – the by-products of agricultural, food, forestry and waste industries – is everywhere, available for conversion into bioenergy. And we are becoming better at pinpointing exactly where to find it, and in what quantity and quality.

**The Australian Biomass for Bioenergy Assessment (ABBA) 2015 – 2021 Project** provides a national database of biomass resources for bioenergy. This interactive online map is available to project developers, policy makers and others to inform bioenergy project decision-making. The project will improve links between biomass suppliers and end users.

**The Australian Renewable Energy Mapping Infrastructure Project (AREMI)** is a central source for sharing mapping data and information with the renewable energy industry. CSIRO's Data61, Australia's Centre of Excellence in Information and Communication Technology Research and Development, is developing this platform. The project consolidates data housed by multiple organisations such as Geoscience Australia, the Bureau of Meteorology and CSIRO. AREMI makes it easier for renewable energy projects to get off the ground in Australia.

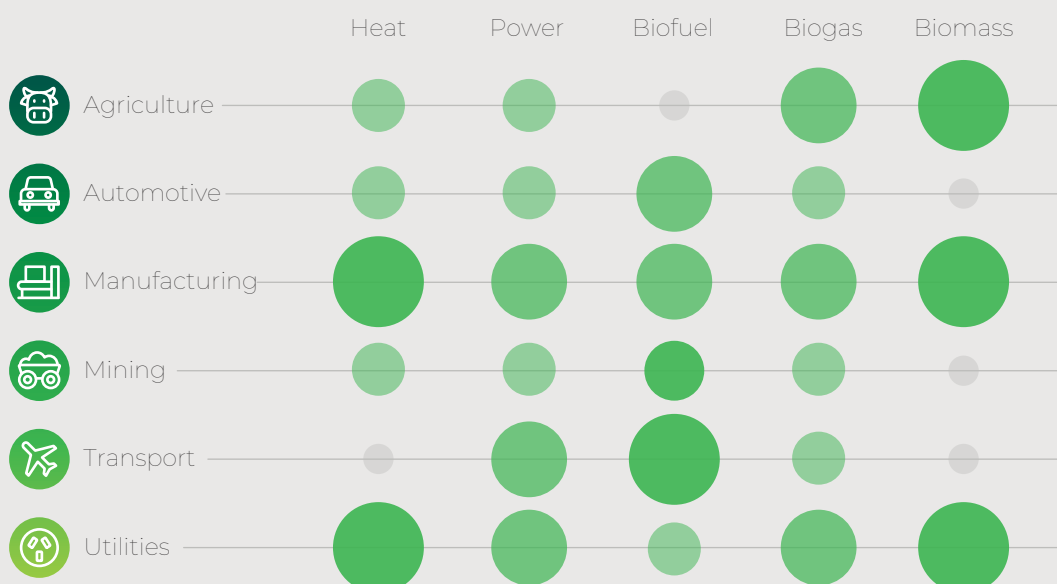
The major feedstocks for bioenergy generation are crop and forestry residues, and urban organic wastes. These resources are plentiful but underused.

We can turn waste that currently creates harmful emissions, human health and environmental impacts into productive, versatile, storable energy. Easily integrated with our existing infrastructure, doing this would directly reduce methane emissions and provide a significant source of renewable energy.

### What is feedstock?

A feedstock is a renewable, biological material, which is either used directly as a fuel, or converted into another fuel or energy product.

### Supply chain value opportunity by industry



# Before our eyes: bioenergy will be integral to the global, rapid energy transformation

Greater use of bioenergy, as part of a renewable energy mix, using proven and commercially-ready technology, has many benefits, as outlined below, including a pathway to net zero carbon emissions:

## 1. Abatement potential

To limit global warming, we need to both reduce carbon emissions and remove it from the atmosphere. Bioenergy can help us meet the Paris Agreement goal of keeping the global average temperature increase “well below 2 degrees”, reaffirmed at the 2021 COP26 UN climate summit in Glasgow. ARENA’s Bioenergy Roadmap estimates the bioenergy sector could reduce Australia’s emissions by about nine percent by 2030.



**Keeping 1.5 alive**

COP26 resolved to strive to limit the temperature increase above pre-industrial levels to 1.5 degrees, with diplomats and activists issuing the rallying cry to ‘keep 1.5 alive’. This is viewed as the threshold beyond which the effects of climate change become increasingly dangerous to people and ecosystems.

UN CLIMATE CHANGE CONFERENCE UK 2021  
IN PARTNERSHIP WITH ITALY

## 2. Economic opportunities

ARENA’s recent bioenergy roadmap estimates the bioenergy sector could contribute \$10 billion in extra GDP per annum by the start of the next decade. The Australian Clean Energy Finance Corporation estimates that bioenergy could attract at a minimum \$3.5-\$5 billion investment, mostly in regional economies. Energy-from-waste (EfW) is being introduced to the national waste management infrastructure portfolio, aimed at recovering energy from non-recyclable residual waste. Infrastructure Partnerships Australia estimates the investment opportunity in EfW at \$8.2 to \$13.7 billion by 2030.

## 3. Employment

The development of a strong bioeconomy can provide skilled employment opportunities to regional areas. The International Renewable Energy Agency (IRENA) 2019 review shows global employment in the bioenergy sector had grown to 3.18 million jobs in 2018. ARENA’s bioenergy roadmap estimates the bioenergy sector could contribute 26,200 jobs by 2030.

## 4. Competitive advantage

Renewable firming (to stabilise the energy grid as uptake of intermittent sources increases), and use of existing infrastructure supporting multiple sectors, is reducing emissions. Infrastructure investment in regional Australia is realising transport efficiencies and providing significant co-benefits.

The COVID-19 pandemic highlighted the fragility of global supply chains. New, local supply chains built on circular economy principles and bioenergy can improve global competitiveness through less reliance on import-based global supply chains, and lower emissions.

## 5. Greater energy security

With COVID-19 highlighting vulnerabilities in Australia’s existing supply chains, the production of renewable energy from biomass can enhance national energy security. Biofuel production lessens reliance on imported oil and petroleum products, promoting energy security. Modelling for ARENA’s bioenergy roadmap calculates bioenergy could provide up to 20 per cent of Australia’s total energy consumption by the 2050s.

## 6. A flexible fossil fuel alternative

Australia has historically relied on traditional approaches to logistics management that have relied in turn on fossil fuels. Bioenergy technologies can operate using existing infrastructure.

## 7. Making the most of our waste

Australia generated an estimated 74.1 million tonnes (Mt) of waste in 2018-19, according to the Department of Agriculture, Water and the Environment's National Waste Report 2020, with 27 per cent going to landfill (20.5 million tonnes). Bioenergy is a commercially viable solution that offers higher order resource recovery than landfill disposal and could divert an extra six per cent of waste from landfill by 2030, according to ARENA's Bioenergy Roadmap.

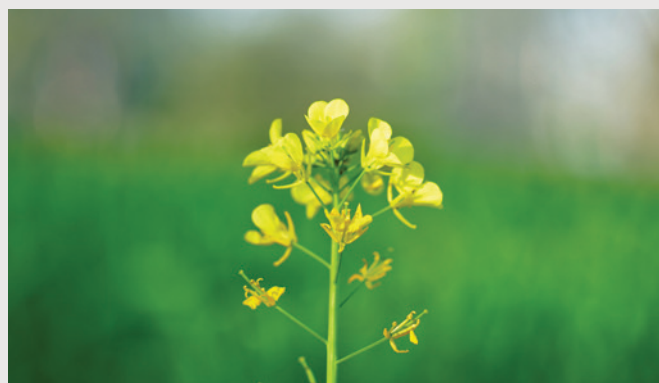
Examples of how this can happen include:

- Directing clean organic materials (e.g. agricultural residues, food and garden organics) to technologies such as anaerobic digestion to retain and cycle the inherent energy and nutrient values of these materials. Digestates and biochars can further reduce carbon emissions by building soil carbon. Agricultural residues can be used for energy recovery and cogeneration, for example the use of bagasse as an energy resource in sugar refining.
- Meanwhile, the energy from contaminated organic materials can be recovered by well-established processes such as landfill biogas capture with bioenergy generation (heat and electricity). This technology already provides about 30 per cent of Australia's carbon abatement with potential to expand. Note that increasing focus and efforts in diverting organic wastes from landfill will likely result in lower overall landfill gas capture potential in the long term.

Across Australia, state policies now preference higher order uses over energy recovery for recyclable materials. However, combustion with energy recovery is generally considered a higher order use for residual wastes otherwise destined for landfill.

### Case Study

## Flying high on mustard seeds



More than 95 per cent of QANTAS' greenhouse gas emissions come from jet fuel. QANTAS has joined forces with bioenergy and agricultural technology companies in North America on a program with Australian farmers to commercialise biofuelled alternatives to jet fuel. Sustainably-grown, non-food mustard seed (*carinata*) is a promising alternative, 80 per cent less emissions-intensive than conventional fuel. QANTAS operated the world's first dedicated biofuel flight, from Los Angeles to Melbourne, in January 2018. The company will invest \$50 million by 2030 towards the development to support its goal of net zero emissions by 2050.



Transport

Biofuel

# What's in the way: barriers to a bigger bioenergy sector

Australia lags other developed countries in the creation of a bioenergy sector.

Bioenergy, as a proportion of total energy supply, leaves us in the bottom quartile of Organisation for Economic Co-operation and Development countries, according to KPMG's Bioenergy state of the nation report (2018). This is due to financial, regulatory, supply and institutional barriers, including:

- Lack of consistent government policy support to drive investment
- Market access challenges due to fossil fuel competition
- A risk-averse investment environment within the Australian energy industry
- Lack of education of the community and industry on the opportunities and benefits of bioenergy
- Lack of incentives or confidence among farmers to participate in bioenergy production

Charting a path: policies, initiatives and incentives for a flourishing bioenergy sector

To build a thriving bioenergy sector in Australia, we need:

- Long term, stable government energy policy supporting decarbonisation
- Mandated decarbonisation of emission intensive industry and energy providers
- Financial support for technology development and development capital
- A culture of learning, education and innovation within the state environmental regulators.

Momentum for bioenergy is growing.

Between 2012 and 2020, ARENA committed \$131 million to 38 bioenergy related projects valued at \$1.4 billion. This funding is fuelling the competitiveness or increased supply of renewable energy in Australia. But we can, and need to do more.

*Overseas experience shows that consistent, sustainable policy support with industry partnerships is integral to establishing and growing a bioenergy industry. Policy by itself, however, is insufficient. Industry should build its capabilities, develop innovative projects and business models and clearly articulate where bioenergy has a comparative advantage against other low emissions alternatives. These integrated efforts have proven to be successful in other jurisdictions and are expected to foster equivalent benefits in Australia.*

ARENA Australia's Bioenergy Roadmap.

## To bolster the bioenergy sector, Bioenergy Australia advocates:

- Mandating a portion of clean fuels across government fleet and procurement contracts.

“Supporting the circular economy by developing procurement targets and timelines for incorporating increasing percentages of recycled materials in government infrastructure projects.”

Reforms to meet Australia’s future infrastructure needs, 2021 Australian Infrastructure Plan, Infrastructure Australia.

- Extending excise reduction support to renewable fuels.
- Funding the development of the Clean Fuels Challenge and Clean Fuels Network, identifying outlets selling Euro 6-compliant fuel, and recognising significant fuel users who commit to cleaner fuels. The aim is to support the development of the local biofuels industry, resulting in lower transport sector emissions and greater national fuel security.
- Developing a renewable gas certification system, so consumers buying green gas know it is of standardised quality and manufactured in Australia.
- Developing a renewable gas injection tariff to introduce feed-in-tariffs to provide biogas producers with a fixed price purchase guarantee for 20 years.
- Implementing a ‘gas swap’ model for biomethane and natural gas. This would allow natural gas consumers to receive the benefits of the green attributes of biomethane supplied and delivered across a multi-user natural gas network.

## Case Study

### Powering business expansion through wood waste-fuelled boiler



MSM Milling is an oilseed crushing, refining and packaging operation in Manildra, New South Wales. In 2019, it completed its Biomass Fuel Switch project, replacing LPG fuelled boilers with a 5 MW biomass fuelled boiler using locally-sourced timber residue, or wood waste, as a fuel source.

The boiler delivers a 70 per cent reduction in thermal energy costs and will result in net emissions reductions of more than 80,000 tonnes of carbon dioxide equivalent during the life of the project (the equivalent of removing 1,500 cars from the road each year). The project will produce 7,100kg/h of steam output at full capacity, to be used in milling and processing operations.

The increased capacity to produce steam at a lower cost with a renewable resource allows the business to expand operations without the risk of exposure to volatile LPG price fluctuations. MSM Milling is one of the first examples of a large Australian agricultural company reducing its costs and environmental impact by using biomass for thermal energy.



Manufacturing

Heating

Biomass

# Blazing a trail: policies, initiatives, and incentives advancing our bioenergy sector

## Queensland

### **Biofutures 10-year Roadmap and Action Plan**

The Queensland Government Biofutures 10-year Roadmap and Action Plan sets out activities to grow the emerging bioenergy sector and position the state as an Asia-Pacific hub for the biofutures industry.

### **Resource Recovery Industry Development Program**

The Queensland Government's Resource Recovery Industry Development Program provides \$100 million in funding and other support over three years to develop a high-value resource recovery industry in Queensland. A key fund objective is to grow biofutures and resource recovery industries and attract investment in new infrastructure.

## Tasmania

### **Tasmanian Bioenergy Vision**

The Tasmanian Government is investing \$3.8 million to implement renewable energy initiatives, including the development of a Tasmanian Bioenergy Vision in 2021. The government says renewable energy could create thousands of jobs and benefit the state for decades to come.

### **Tasmanian Bioenergy Future Online Summit**

The Tasmanian Government hosted a Tasmanian Bioenergy Future Online Summit in November 2020 to provide an opportunity for the agriculture, farming, industrial, energy, transport, mining, and local government sectors to understand potential opportunities in bioenergy and the bioeconomy.

### **Tasmanian Renewable Energy Action Plan**

The Tasmanian Government's Tasmanian Renewable Energy Action Plan 2020 wants to "accelerate the adoption of bioenergy. Bioenergy is an internationally recognised form of renewable energy and Tasmania has an abundance of underutilised wood waste and other feedstocks". The Department of State Growth is developing options to expand the domestic processing and bioenergy sectors.

## Tasmania Energy Strategy

The Tasmania Energy Strategy released in 2015 included \$200,000 funding for biofuels, \$550,000 in funding for forest residues and \$1.25 million in funding for wood and fibre processing. The energy strategy is under revision with stronger bioenergy support expected.

### **Tasmanian Agriculture Research, Development and Extension for 2050**

The Tasmanian Government's Growing Tasmanian Agriculture Research, Development and Extension for 2050 White Paper outlines investment in sustainable growth and productivity of Tasmanian agriculture and food sectors. A circular economy model is identified as an emerging priority and the bioeconomy sits under this priority.

### **Waste Action Plan**

The Tasmanian Government's draft Waste Action Plan, released in 2019, is a framework for the discussion with local government, business and community on how best to address our waste and resource recovery challenges. It includes an action to continue to investigate and provide appropriate support for energy-from-waste and bioenergy options, including the management and use of forest residues.

## New South Wales

### **NSW Climate Change Policy Framework**

The NSW Climate Change Policy Framework (October 2016) acknowledges the shift to a net-zero emissions economy is likely to create new opportunities in sectors including agriculture, advanced energy technology, and the government will look for opportunities to grow emerging industries.

### **NSW Decarbonisation Innovation Study**

The NSW Decarbonisation Innovation Study (August 2020) highlights some of the benefits of bioenergy, including in heating and electricity generation, reducing fossil fuel use, and as a potential value-add for landholders to generate income from waste feedstock and underutilised land. The NSW DPI Climate Change Research Strategy is investigating bioenergy opportunities.

### NSW DPI Net Zero Plan Stage 1: 2020-2030

The NSW DPI Net Zero Plan Stage 1: 2020-2030 looks at landfill diversion policies, and the development of waste-to-energy facilities, and the creation of biogas from organic waste to generate electricity, or to make the natural gas supply 'greener'. The NSW government will establish a Clean Technology Program to develop and commercialise emissions reducing technologies.

### The Climate Change Fund

The NSW Office of Environment & Heritage introduced The Climate Change Fund in 2007 under the Energy and Utilities Administration Act 1987 which encourages energy and water saving activities and contributes to research and development programs, some of which support the application of biomass production for bioenergy.

### Biofuels mandate

NSW introduced the first biofuels mandate in Australia, in 2007. The mandate required certain fuel retailers to sell a minimum percentage of biofuels, as a step towards reducing NSW's dependence on fossil fuels and reducing the state's reliance on imported petroleum products. Queensland followed suit with a mandate in 2017. The number of service stations offering the 10% ethanol blend E10 has increased.

### Case Study

## Jemena Sydney Water Malabar Renewable Methane Project



Thousands of Sydney homes and businesses will use renewable green gas for cooking, heating and hot water thanks to Australia's first biomethane-to-gas project. Energy infrastructure company Jemena and Sydney Water have agreed to generate high-quality biomethane gas, with zero-carbon emissions, at the South Sydney Malabar Wastewater Treatment Plant.

The gas will go into Jemena's New South Wales gas distribution network, which is Australia's largest, with 1.4 million customers. The Malabar Wastewater Treatment Plant is one of Sydney Water's Anaerobic Digestion (AD) facilities. Most of the biogas produced goes to electrical power generation and water heating. What cannot be used is burnt using waste gas burners.



Utilities

Electricity

Biogas

## Western Australia

### Waste recycling plant

The Western Australia Government announced in January 2021 it will invest a \$2 million grant from the Collie Futures Industry Development Fund to secure a \$9.4 million waste recycling plant for the Collie region. Renergi Pty Ltd will build a commercial-scale demonstration plant to recycle municipal solid waste and waste biomass to produce bio-oil and biochar. The bio-oil will be sold to local industrial customers as a liquid fuel to generate industrial heat, while the biochar will be sold to WA farmers as a soil conditioner. The project contributes to a circular economy by diverting council waste from landfill and turns it into energy and other valuable by-products.

### BioFuels taskforce

In 2007, the Western Australian Government created a BioFuels taskforce to examine Biofuel opportunities. The taskforce made 22 recommendations.

### Western ways: bioenergy potential in Australia's biggest state

The Western Australia Government estimates Western Australian farmers produce more than 10 million tonnes of waste biomass every year, presenting commercial opportunities for new industries. By-products include cereal straw, dairy effluent, plantation residues, grape marc and tomato vines and remain not widely commercialised. Annual cereal straw totals about seven million tonnes and, the government says, has significant commercial potential. It says an ethanol plant, such as built in Crescentino, in northern Italy, could convert 220 000 tonnes of straw into 40 000 tonnes of ethanol.

## Businesses using biomass in Western Australia

Garden supplies company **Richgro**, in Jandakot, south of Perth, installed an **\$8 million enclosed anaerobic digestion plant** to turn organic waste that would have gone to landfill into clean energy and power that it can export back to the grid. The company recycles solid and liquid waste from breweries, chicken farms, supermarkets and other food suppliers. The plant can process an average of 137 tonnes of commercial and industrial organic waste per day or 50,000 tonnes per year. It is also producing an average of 60,000 litres of biofertiliser per day. The plant can generate 28,800 kilowatts per day, enough to power 1,800 households a day with clean energy.

**Morton Seed and Grain** in Wagin process oats for the local and international breakfast cereal markets. They have replaced their gas and electricity power supplies with a bioenergy unit that produces all the heat and power they need using the oat husks as a fuel source.

**Macco Feeds** in Williams have replaced their gas-fired boiler with a wood-fired boiler to supply the heat and steam they need to make their products. They use up to 4000 tonnes of mallee and plantation grown woodchips per year and generate up to 1.7 megawatts of energy.

Eastern Metropolitan Regional Council in Perth is developing a **Wood Waste to Energy Plant**. The council has recycled timber at its Hazelmere Resource Recovery Park since 2009. Untreated waste wood (such as pallets, packaging and crates, off-cuts and cable reels) is processed into woodfines and woodchip. The woodfines are sold as an end product to established markets, whilst the woodchip has limited markets. The Wood Waste to Energy Plant will convert woodchip destined for landfill to renewable electricity and bio-char. The electricity generated will be used as a power source for the onsite facilities and excess electricity will be exported to a third party via a dedicated power cable.



## Victoria

### Recycling Victoria: A new economy

The Victorian Government's Recycling Victoria: A new economy (February 2020) is a circular economy plan to "cut waste and boost recycling and reuse of our precious resources". It encourages investment in waste to energy infrastructure, including facilities that use organic waste via bioenergy or provide precinct-scale energy.

Yarra Valley Water has developed a food waste to energy facility, which reduces landfill, cuts greenhouse gas emissions, and keeps customers' water bills down.

Yarra Valley Water's anaerobic digestion facility at its Aurora Sewage Treatment Plant in Wollert. The facility accepts 33,000 tonnes of food waste per year (sourced from markets and food manufacturers) and produces 22,000 kilowatt-hours of electricity a day—enough to power 1,300 homes. This bioenergy generated powers the neighbouring sewage treatment plant, with the remaining energy going to the grid.

### Sustainability Fund

The Victorian Government's \$500 million Sustainability Fund which receives funds from Victorian landfill levies to redistribute as grants to support projects, programs, services or technologies that will benefit Victoria environmentally, socially and economically. The 2020-21 Sustainability Fund Activities Report lists support for a variety of bioenergy waste-to-energy projects.

### Waste to Energy Infrastructure Fund

The Waste to Energy Infrastructure Fund directly supports investment in waste to energy technologies that support the state's transition to a low carbon economy and the creation of full-time employment.

### Bioenergy Infrastructure Fund

Sustainability Victoria's Bioenergy Infrastructure Fund supports projects that use bioenergy technologies for the recovery and reprocessing of organic waste from commercial, industrial and municipal sources.

### New Energy Technology Sector Strategy

The Victorian Government's New Energy Technology Sector Strategy (March 2016) sets out the need to implement an industry development plan for the bioenergy sector.

### Project-based activities scheme

The Victorian Energy Upgrades program's Project-based activities scheme incentivises fuel-switching from fossil-based thermal energy to biomass-based renewable thermal energy. For every tonne of verified greenhouse gas emissions abatement, the project is assigned a certificate the value of which varies based on market supply and demand.

## South Australia

### Bioenergy Roadmap for South Australia

The Bioenergy Roadmap for South Australia, commissioned by the state government, provides a foundation for research, industry discussions and funding for the development of bioenergy projects in South Australia.

### South Australia Energy Plan

The South Australia Energy Plan directly supports the \$150 million Regional Growth Fund, which has a focus on enhancing regional infrastructure (inclusive of waste-to-power plants) and the \$150 million Renewable Technology Fund which aims to catalyse private investment to support further integration of bioenergy technologies.

## Australian Capital Territory

### ACT Waste Management Strategy

The ACT Waste Management Strategy 2011–2025 sets objectives for achieving no waste to landfill and was a result of community consultation. The strategy also supports the potential of innovative bioenergy technologies.

### ACT Sustainable Energy Policy

An important element of the now introduced ACT Sustainable Energy Policy 2020-25 is that it respects the waste hierarchy, and waste reduction, reuse and recycling of materials will take precedence over energy recovery applications. Thermal treatment of waste including incineration, gasification and pyrolysis will not be permitted in the ACT other than for existing plants which can continue operation. Non-thermal means of energy recovery such as anaerobic digestion, or the production of refuse derived fuel will be allowed. In addition, where waste-to-energy activities are permitted in the ACT, only residual waste will be eligible as a fuel.

# Opportunity knocks: now is the time to explore bioenergy's potential

Pioneering bioenergy projects and forward-thinking government policies are lighting the way to a thriving future bioenergy sector.

With active federal, state and territory government support, the opportunities are limitless. The main differences in countries with a strong bioeconomy is political leadership and a whole-of-government approach to the bioeconomy.

Bioenergy Australia welcomes the recent development of ARENA's bioenergy roadmap — a first national framework for the development of a thriving bioenergy sector that can:


- Play a significant part in Australia's energy transition
- Help Australia meet its emission reduction commitments
- Open the door to economic opportunities and diversification.

Following the recent devastating bushfires and the COVID-19 crisis, the roadmap presents us with a critical recovery opportunity for Australia to invest in developing new-wave domestic industries, such as the bioenergy sector. Bioenergy development offers significant and sustained job creation and economic stimulus, while also boosting our self-sufficiency in fuel, gas and energy and other key industries.

To discuss the great bioenergy opportunity before us in more detail and examine how your organisation can embrace policies and practices that contribute to a more circular economy, please contact:

“The Bioenergy Roadmap lays out a vision for a sustainable bioenergy industry that delivers lower emissions, regional growth, energy resilience and waste management benefits for Australia.”

Australia's Bioenergy Roadmap,  
Australian Renewable Energy  
Agency

 0421 430 665

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This work was co-funded by the IEA Bioenergy Technology Collaboration Programme (TCP) through its Task 36 - Material and Energy valorisation of waste in a Circular Economy.

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## Bioenergy Australia

### Our Work

We are committed to accelerating Australia's bioeconomy. 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.

Australia lags behind the world when it comes to bioenergy, and we aim to change that. We empower, share knowledge, and connect Australian bioenergy producers, investors, researchers, and users to make Australia's bioeconomy world-class.

We Advocate

We Campaign

We Inform

We Connect



Be a part of Australia's bioenergy future: Get in touch today.



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