The Victorian Renewable Energy Target (VRET) will see 25 per cent of the State’s electricity generation supplied from renewable sources by the year 2020, increasing to 50 per cent by 2030. These targets will encourage investment in new energy projects, create jobs, lower electricity prices and secure Victoria’s electricity supply. Increasing renewable energy capacity will also reduce greenhouse gas emissions. Victoria aims to achieve 15 to 20 per cent reduction in emissions by 2020 (from 2005 levels) and net zero emissions by 2050.

What is bioenergy?
Bioenergy is a type of energy produced by converting a biomass (solid or liquid) to electricity, heat, liquid fuels and even fertilisers as a by-product through a process of either combustion, thermal decomposition, fermentation or digestion. Bioenergy systems for heat and/or power range from less than 100kW to more than 50MW in capacity and have applications in agricultural, industrial and residential settings (your wood-burning stove is effectively a bioenergy system). In Victoria, bioenergy systems operate across many industries including winemaking, pork, paper and timber industries.

What is biomass?
Biomass is organic matter that contains stored energy from the sun which can be unlocked to generate bioenergy. Biomass includes materials such as:

- agricultural residues, animal and human wastes
- timber and wood processing residues
- organic wastes from various industries such as food, construction and pulp and paper
- purpose-grown energy crops
- woody weeds
- algae

1 Biorefineries can produce a multitude of liquid fuels from jet fuel to bioethanol.
• biodegradable municipal waste streams
Technically, coal and oil are forms of biomass, but they’ve taken millions of years to form. Biomass used in sustainable bioenergy systems is constantly replenished by the natural carbon cycle.

What are biofuels?
Biofuels are energy carriers which store the energy to be used from a solid, liquid or gaseous phase. Biofuels include gases such as biogas, synthesis gas (syngas) and biomethane and liquids, such as bioethanol and biodiesel.

What is biogas?
Biogas is produced when organic matter is broken down in an oxygen-free (anaerobic) environment. The composition varies according to the raw materials and processing methods however it primarily consists of methane, a flammable gas, and carbon dioxide, plus traces of other gases including nitrogen, hydrogen and hydrogen sulphide.

Case study: Berrybank Farm – Windermere, VIC
Berrybank Farm established their piggery in 1970. In 1991, they undertook an ambitious project to collect methane from the piggery waste to generate electricity for the farm and excess feeds back into the electricity grid.

By 2011, the farm had expanded to 20,000 pigs and they started to produce potting mix and fertiliser from the piggery waste. With these two operations occurring on the farm, over 100 megalitres of water is saved annually and the 3-stage heat recovery process recovers at least 1,200kWh of energy a day which equals to 438 MWh per year. As a result, the generators can run longer, producing more electricity, about 190 MWh per annum. This saves approximately 740 tonnes of CO$_2$ per year.

What is syngas?
Syngas is made from the pyrolysis or gasification of biomass and contains carbon monoxide, hydrogen, some carbon dioxide and a small proportion of contaminants. It is used primarily to generate electricity but can be used as a transport fuel.

What is biomethane?
Like biogas, biomethane is produced when organic matter breaks down in the absence of oxygen. Methane is its fossil-fuel based equivalent and is measured to have 25 times the greenhouse impact of carbon dioxide. Biomethane fuelling an engine or distributed in a natural gas pipeline replaces its fossil-fuel based equivalent.

Bioenergy in the wine industry
Near Mildura, Colignan based Australian Tartaric Products (ATP) has developed a sustainable, end-to-end solution to waste from the wine industry. ATP collects grape marc and lees from regional wineries and extracts Grape Spirit and Tartaric Acid which are processed and packaged for use. The grape marc waste is used again to generate steam for the manufacturing process and electricity to power the site. Given the characteristics of the by-product of the process residuals such as gypsum, marc and marc ash are supplied back to the agricultural sector, ensuring minimal environmental impact.

Bioenergy vs. waste to energy
The bulk of bioenergy facilities in Victoria and Australia use waste organic feedstock but in some parts of the world energy crops are purpose grown for bioenergy facilities. Best practice bioenergy facilities are very low in emissions and while no facility can avoid emitting carbon dioxide, the efficiency of modern plants along with their by-products, can produce a carbon negative result. The difference is that bioenergy facilities use renewable feedstock, as part of the circular carbon cycle, whereas non-renewable waste to energy facilities produce excess emissions, beyond the natural carbon cycle’s ability to absorb them.

The future for bioenergy
Bioenergy will increasingly become a major source of renewable energy in Victoria, particularly for commercial and industrial facilities that produce biomass and need some form of energy. The next bastion for bioenergy in Victoria is proving viability at the medium scale, in excess of 5 MW electrical capacity.

While bioenergy generators tend to be smaller in capacity than hydro plants and wind farms, in terms of delivered energy, they are well beyond that of the nameplate
capacity of solar and wind. Some bioenergy projects can alleviate amenity issues, such as odour, and are often situated in regional areas, providing further employment and capability building opportunities.

How are bioenergy projects assessed?

Any facility with a capacity of under 1MW electrical or 3MW thermal requires local government approval. Anything above those thresholds requires Environment Protection Authority approval through their Development Assessment Unit. There are a series of State Environmental Protection Policies that apply for bioenergy facilities (administered by the EPA) and Energy Safe Victoria gets involved where gas handling or electrical conversion pathways are involved.

What role can the community play?

Bioenergy facilities in Victoria are largely embedded within existing commercial or industrial facilities and often have the right planning overlay to allow for their development. Where more centralised facilities are planned, early engagement with the community will enable greater buy-in and appreciation for the benefits that ensue. Bioenergy facilities require local community capability in the form of operational and maintenance skills, fuel preparation and treatment, activating supply chains and demonstrating circularity.

For more information:

- [https://www.bioenergyaustralia.org.au](https://www.bioenergyaustralia.org.au)

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2 Nameplate capacity refers to the actual output of an energy generating facility, the actual delivered capacity of solar and wind average 20 to 25% and 30 to 35% respectively but for most modern bioenergy facilities it is over 90%.