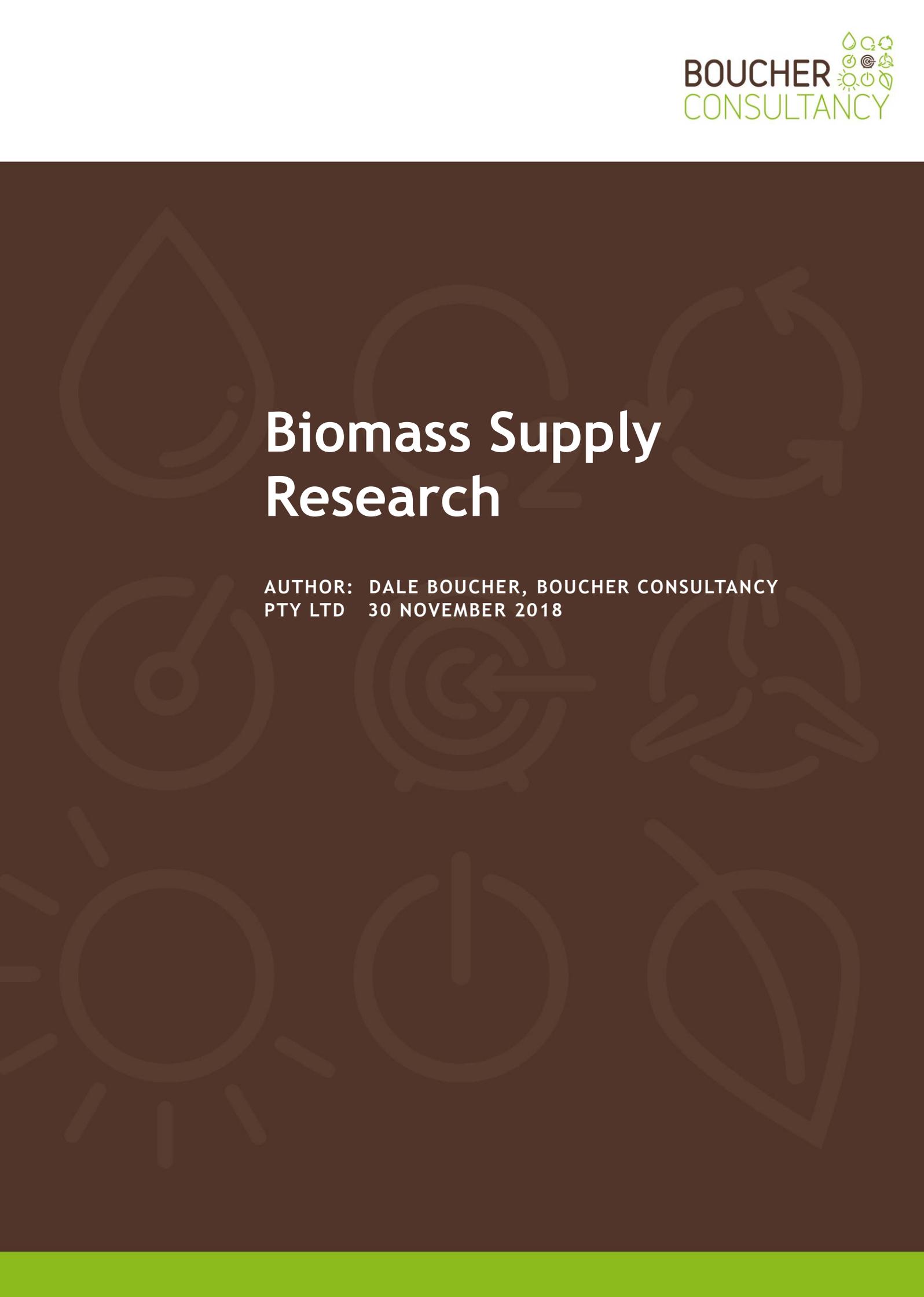


Biomass Supply Research

The background of the cover is a dark brown color with several large, faint, light brown icons scattered across it. These icons include a water drop, a circular arrow, a leaf, a sun, a power button, and a leaf with a vein, which are the same symbols used in the Boucher Consultancy logo.

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1. Executive Summary

- There are 21 biomass equipment manufacturers who have distributors in Australia or deal directly with the Australian market. The bulk of manufacturers are located Austria, Poland and Denmark. The 21 biomass manufacturers have specified woodchips as a recommended biofuel.
- 11 woodchip biomass boilers are currently operating in Victoria. Gippsland has several biomass installations that heat glasshouses for food production. These biomass units have replaced brown coal briquette boilers.
- Larger biomass boilers accept a wider range of woodchip sizes and moisture content. Smaller biomass boilers (eg. Beaufort Hospital) will specify minimal tolerances on woodchip dimensions and moisture content.
- The moisture content of woody biomass has a direct correlation on performance. Wood with 50% - 60% moisture will provide half the energy of wood with 15% - 25% moisture. Wood with a higher moisture content will also produce higher particle emissions.
- Biomass boilers will not accept both wet and dry biofuels. Most manufacturers recommend a woodchip with a moisture content less than 30% - 35%. When using wet woodchips (40% - 60% moisture) the boiler design will be modified to maximise performance and minimise emissions. Developments in fuel feeding to the furnace, air pre-heaters, ceramic inserts and energy management can result in minimal reductions in energy output and emissions from wet biofuel.
- Biomass boilers and their feed systems are designed and manufactured for the biofuel a client has selected. Interchanging biofuels (eg. woodchips and straw pellets) may affect the performance, useful life and warranty in some models. Some manufacturers allow biofuel interchangeability and this should be considered when tendering for a biomass boiler.
- Eucalyptus and softwoods like radiata pine are acceptable for use in biomass boilers and have a similar calorific value. Eucalyptus by volume is 30% - 40% heavier so hoppers, feeders and augers need to consider the additional weight of Australian natives.
- Recommend the purchase of biomass boilers that are EN 303-5:2012 certified. This will ensure the boiler is manufactured to a high standard, has a high burn efficiency and the CO², particle PM_{2.5} and PM₁₀ and Organic Gaseous Compounds (OGC) emissions will be lower than Australian requirements. The Meredith Dairy, Pyrenees Sawmill and Beaufort Hospital have boilers that are EN 303-5 certified.
- The European biomass standards have been developed over many years. European Nation (EN) standards are now being updated to worldwide standards through the International Standards Organisation (ISO). Australia is a member of the ISO. An adopted ISO standard takes precedence over the corresponding EN standard.



- Several organisations in regional Victoria are interested in supplying woodchips and straw pellets to the biomass market. Wet woodchips and woodchips from waste recyclers are the cheapest options.
- Unlike Europe, there are no mandatory standards for biofuel quality in Australia. Biofuel suppliers and the end user will need to ensure the biofuel has a consistent moisture content and free from contaminants.
- Under the state Government Victorian Renewable Energy Target (VRET) and Federal Government Renewable Energy Target (RET), biomass fuel sourced from native forests will not be classed as 'Renewable Energy'.

2. Biomass Boilers Available in Victoria

Biomass boilers are not manufactured in Australia but there are 21 international manufacturers who have distributors in Australia or deal directly with Australian clients. Of the 21 biomass manufacturers, 4 have installed boilers in Victoria. The biomass manufacturers are from the following countries:

- Austria
- Poland
- United States
- Denmark
- Asia
- South Africa
- New Zealand
- Italy
- Czech Republic

What is the Biomass Lead Time?

Each biomass boiler is manufactured to the client's specifications and lead time is 3 - 4 months from order to delivery. Before manufacturing a biomass boiler, the manufacturer will require:

- The biofuel you be using
- If woody biomass, the type of tree sourced
- Moisture levels and diameter of the biofuel
- Calorific value, ash content and fusion point of biofuel



- Available space to install a biomass plant m²
- Distance to power supply
- Average temperature, humidity and altitude of boiler location (city)

I have attached a sample biomass boiler questionnaire in appendix 4.

Biomass Boiler Manufacturers

Moderator biomass boilers are manufactured in Poland and specialise in smaller biomass units. The unit sizes range from 30 kW to 500kW. The importer is Dragon NRG. All Moderator boilers comply with EN 303-5 certification. Their emissions are class 3 (see attached standard EN 303-5 table 6 page 38). The boilers are predominately used for heating water. Moderator make separate models for lower moisture fuel and wet biofuel. A cast iron head will be used for low moisture content and will accept moisture levels up to 25%, A ceramic head is inserted for higher moisture materials and this model can only accept a range of 25% - 40% moisture levels. A low moisture woodchip cannot be fed into a model with a ceramic head as the system would get too hot and damage the boiler. The ideal woodchip diameter for Moderator boilers is 45mm diameter. There are 2 moderator models in Victoria (Meredith Dairy and Pyrenees Sawmill) and both models have the cast iron head for lower moisture woodchips. Shaun Quayle from Dragon NRG believes the Moderator units are good value with solid good build quality at a reasonable price. <http://www.moderator.com.pl/en/products/industrial-solutions>

Mabre biomass boilers are manufactured in Italy and specialise in smaller biomass units. The unit sizes range from 25kW to 4.4MW. The importer is Dragon NRG. Mabre models do not comply with EN 303-5 but they do comply with Italian specifications for build quality. Their boilers are predominately recommended for heating air. Mabre recommend a 25% moisture content and 45mm diameter for their woodchips. Their boilers can accept a wide range of biofuel including pellets, grains, olive pits and manure but these fuels are not interchangeable. There are no Mabre boilers in Australia.

<http://mabreairsystems.com/wp-content/uploads/2017/07/Mabre-English-Commercial-Biomass.pdf>

Lin-ka biomass boilers are manufactured in Denmark, the build quality is excellent however they are more expensive than other manufacturers. The importer is Dragon NRG. They have a wide variety of sizes from 100kW up to 15MW. Their models up to 1000kW are EN 303-5 certified. Lin-ka make separate models for shredded straw bales, wood pellets and woodchips. The recommended moisture levels are up to 35%. Their boilers are used to provide hot water or steam. For biofuels with a consistent moisture levels over 35%, Lin-ka will install ceramic tiles in the fire box. The downside of a higher moisture fuel is reduced performance (eg. a 400kW boiler will only generate 250kW). Their recommended woodchip diameter size is 45mm. Shaun Quayle from Dragon NRG has quoted Lin-ka for several tenders but they were too expensive and did not win the tender. There are no Lin-ka boilers in Australia. <https://www.linka.dk/en/products/hot-water-and-high-pressure-hot-water-plant/wood-chips-100---15000-kw/>



Granpal biomass boilers are manufactured in Poland and sizes range from 15kW to 7MW. The importer is Dragon NRG. Boilers are placed in 3 categories (small, medium and mega). The medium range (200kW - 600kW) has different models for wet biofuel and dry biofuel. The dry model will accept moisture levels up to 25%, and the wet model will accept moisture levels from 25% - 45%. The fuels include woodchips, pellets, sawdust, shredded wood waste, straw pellets and fruit pits. The recommended woodchip diameter is 45mm. Medium size boilers are EN 303-5 certified and emissions are rated class 5 (the lowest category).

https://docs.wixstatic.com/ugd/e24175_dc42ecc578624f91a1b504ab0536f243.pdf

All Power Labs biomass boilers are manufactured in the United States and are a biomass unit generating electricity and biochar. APL have a 25kW, 100kW and 150kW models and there is no distributor for Australia. Boilers accept woodchips up to 40% and the recommended woodchip diameter is between 16mm - 45mm. The 150 kW system comes complete in a shipping container. Units are not EN303-5 compliant. There are no All Power Labs biomass boilers in Australia.

<http://www.allpowerlabs.com/products/100kw-powertainer>

Uniconfort biomass boilers are manufactured in Italy and the importer is the ACT group. Uniconfort offer a wide range of boiler sizes from 200kW up to 30MW. The boilers can be used for heating air, hot water, steam and electricity generation. Uniconfort boilers accept woodchips, pellets, bark, olive and vine prunings. 3 boiler models are offered with varying moisture levels:

- ATOM boiler (200kW) will accept moisture up to 30%
- EOS boilers (500kW - 5MW) will accept moisture up to 40%
- GLOBAL (1MW - 14MW) will accept up to 50%

Uniconfort accept a wide range of woodchip sizes from 30mm to 250mm. Systems less than 1,000kW can accept up to 45mm woodchips. Over 1000kW boilers can accept up to 125mm woodchips and their large systems can accept up to 250mm diameter woodchips through a larger auger. Uniconfort boilers are EN303-5 compliant. There are no Uniconfort installations in Australia.

<https://www.uniconfort.com/en/products/heating-systems/>

Polytechnik biomass boilers are manufactured in Austria and specialise in larger systems over 1MW. The Australian distributor is Enrivo. Their main purpose is to provide hot water, steam, hot air and electricity. Polytechnik offer containerised systems up to 500kW and indoor/outdoor units go up to 20MW. Accepted biofuels include woodchips, bark, forest residue, hogfuel (crushed wood), wood shavings, sawdust, pellets, briquettes and manure. The recommended woodchip diameter is 50mm. Models will be manufactured depending on the fuel source and moisture level so the end user must use a biofuel with consistent moisture content. The 5 installations in Gippsland have been designed to accept a higher moisture fuel up to 50%. These systems are taking fresh woodchips from nearby sawmills. The smaller systems are EN303-5 compliant.



https://www.all-energy.com.au/RXAU/RXAU_All-Energy/documents/2016/2016%20day%20%20presentations/Wed%20216%201320%20Sohum%20Gandhi.pdf?v=636117503622907294

Hargassener biomass boilers are manufactured in Austria and specialise in smaller size installations. Hargassener make separate models for pellets, woodchips, logwood and a combi pellet/logwood. Boiler sizes vary from 60kW to 330kW and designed to provide hot water. Manufacturer recommends woodchip moisture levels between 20% - 35% with a woodchip diameter between 16mm and 45mm. All boilers are EN 303-5 compliant and emissions are class 5 (the lowest category). Hargassener have a 110kW biomass unit at the Beaufort Hospital.

https://www.hargassner.at/heizung/Article/ID/81/Session/1-q9LWDDK8-1-IP/Wood_Chip_Boilers.htm

Herz biomass boilers are manufactured in Austria and imported through Heatwise Solutions. Herz specialise in smaller biomass units from 30kW to 4.5MW and the boilers can generate electricity, steam, hot water and air. Biofuel preference is woody products including chips, pellets and logwood. Recommended woodchip moisture level is a maximum 35% and a diameter between 16mm and 45mm. Smaller models are EN 303-5 compliant and their emission are class 3,4 or 5 depending on the model chosen. The first Herz Australian installation will be at the Devonport Aquatic Centre later in the year.

<https://www.herz-energie.at/en/products/wood-chip-pellet-boiler/>

Binder biomass boilers are owned by Herz and manufactured in Austria, they are imported through Heatwise Solutions. Biomass units vary in size from 200kW to 20MW and primarily used to generate steam, hot water and air. Biofuel preference is woody products including chips, pellets, logwood, sawdust, wood shavings, bark and shredded shipping pallets. Woodchip specification is a moisture level up to 40% and a diameter between 16mm and 31mm. Models are EN 303-5 compliant and their emission are class 3,4 or 5 depending on the model chosen. There is one installation in Australia at the Mt Gamier Aquatic Centre. <https://www.binder-gmbh.at/en/boiler/>

Pasqualichio biomass boilers are an Italian manufacturer that specialises in smaller systems from 30kW to 4MW. The Australian distributor is McKeeko. Primary purpose is hot water or steam. Biofuel preference is wide ranging and they accept a mixture of stone pits, woody biomass (including woodchips) and olive pits. Woodchip specifications is up to 30% moisture content and they also make a model that accepts up to 50%. Boilers up to 500kW are EN 303-5 compliant. Emissions are class 5 (the lowest category). There are no Pasqualichio biomass boilers in Australia.

<http://www.ctpasqualicchio.it/eng/images/cataloghi/caldaie.pdf>



Airtight Solutions are a New Zealand company with offices in Australia. Biomass boilers are manufactured in New Zealand. Airtight solutions specialise in minimising wood waste in the woodworking, agricultural and hay industries. Their biomass systems range in size from 300kW to 3MW and their units heat water or air. Their 350kW - 700kW models can be containerised. Recommended woodchip size is 20mm. They accept a wide range of woody biomass fuels including chips and pellets. Their models are not EN303-5 compliant. There are no Airtight biomass units in Australia.

<https://www.airtight.com.au/product/containerised-wood-waste-fired-heat-plant/>

TFD biomass boilers are manufactured in South Africa and the Australian distributor is Simons Boilers. Boiler range varies from 500kW to 10MW and their primary purpose is to provide steam (up to 180⁰ Celsius), and hot water. TFD boilers accept moisture levels up to 50% and their boilers are not EN303-5 certified. There are no TFD biomass boilers in Australia.

<https://www.tfdesign.co.za/turnkey-engineering-solutions/biomass-steam-boiler-system-2/>

Powermax biomass boilers are manufactured in China and there is no Australian distributor. Boiler sizes range from 50kW to 20MW. Boilers used for hot water, steam, hot air and electricity. Powermax accept a large variety of biofuels including chips, pellets, fruit pits and straw waste. Powermax have not responded to email therefore moisture content and woodchip diameter are unknown. Boilers are not EN 303-5 certified. There are no Powermax biomass boilers in Australia.

<http://www.wxteneng.com/en/products.html>

Enertech biomass boilers are manufactured in the Philippines and there is no distributor in Australia. Enertech specialise in larger installations and their sizes go up to 10MW. Enertech recommend several different biofuels including coconut shells, grains, pits and woody biomass including chips and pellets. Their boilers sizes are beyond the EN 303-5 certification threshold. There is one Enertech biomass installation at Unigrain in Smeaton. <http://www.enertech.com.ph/index-orig.php#>

Fengyu biomass boilers are manufactured in China and there is no Australian distributor. Boiler sizes vary from 30kW to 15MW. Recommended biofuel includes all woody and straw based fuel including chips, pellets and straw pellets. Recommended biofuel moisture levels are less than 15% and the woodchip diameter is 10mm. Fengyu boilers are not EN303-5 certified. There are no Fengyu biomass boilers in Australia. http://www.fengyugroup.com/products/index/mid/8_13

Ankur biomass boilers are manufactured in India and there is no Australian distributor. Ankur specialise in small systems with sizes ranging from 20kW to 2.2MW. Ankur boilers predominately supply electricity and thermal heat. Recommended biofuels include chips, pellets, firewood, bamboo, corneucalyptus and sawmill waste. Recommended Moisture levels are up to 20% and woodchip diameter is



not specified. Ankur biomass units are not EN 303-5 certified. There are no Ankur biomass boilers in Australia. <http://www.ankurscientific.com/>

Vincke biomass boilers are designed in the Czech Republic and manufactured in Belgium. The Australian distributor is JDM Aust. Vincke specialise in large installations with boiler sizes varying from 3MW to 25MW. Recommended biofuels include agricultural residues, Almond hulls, tree prunings, bark, reject fibres and saw trimmings. Vincke have not specified a recommended moisture content or woodchip dimensions. Vincke boilers are over 500kW and above the EN 303-5 certification capacity. There are no Vincke biomass boilers in Australia.

https://www.vyncke.com/solutions/solution-range/#.W_TFhuJxXIU

D'Allesandro Termomecania is an Italian biomass manufacturer that specialises in small to medium systems from 100kW to 4.1MW. The Australian distributor is Biesse. Primary purpose is hot water and steam. Recommended moisture levels are 30% or their GM boiler can take up to 50%. Recommended woodchip diameter is 50mm. Boilers accept Woodchips, pellets, almond husk, olive husks. Models up to 500kW are EN 303-5 certified and the emissions are class 5 certified (the lowest category). All models over 500kW are still EN 303-5 compliant but class 3 emission levels. There are no D'Allesandro Termomecania boilers in Australia. <http://www.caldaiedalessandro.it/en/product-boiler-cs-model/>

Justsen biomass boilers are manufactured in Denmark and Justsen Pacific are the distributors for Australia. This company specialises in large installations and their boiler sizes range from 1MW to 20MW. Justsen also manufacture smaller units down to 300kW but their specialty is bigger installations. Their boilers can be used to generate electricity, steam or hot water. Boilers accept wood waste (wet or dry) pellets, briquettes, straw pellets, grains. Their moisture levels of woodchips vary from 10% to 55% and preferred woodchip diameter is 55mm. Justsen will custom manufacture a boiler that is suitable for the intended moisture. Modifications will be made to boilers fuelled by a higher moisture woodchip. Systems are over the 500kW threshold for the UN 303-5 certification.

There are no Justsen biomass boilers in Australia. <http://justsen.dk/products/hot-water-boilers.aspx>

Volter are manufactured in Finland and these biomass boilers are new to the market. Currently no distributor for Australia. Volter specialise in combined heat and power (CHP) units. A single unit can provide 100kW of heat and 40kW of electricity from woodchips. Volter boilers can be joined for multiple arrays to make larger systems. Recommended moisture content of woodchips is less than 20% and diameter between 16 and 30mm. <https://volter.fi/>



Biomass Boilers available in Victoria

Manufacturer	Importer	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	Boiler Location	Installed in Aust
Moderator - Premium set. Cast iron burner	Dragon NRG	Poland	Water Air (via heat exchanger)	30 kW-240 kW	<25%	P45 wood chips, sawdust, bark, peat, pellets, briquettes with bulk density up to 450 kg / m3, with moisture content up to 25%	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	class 3 EN 303-5	Indoor/outdoor/container	Meredith Dairy and Pyrenees Sawmill
Moderator - ceramic burner	Dragon NRG	Poland	Water Air (via heat exchanger)	30 kW -240 kW	25% - 40%	P45 woodchips, some types of sawdust, bark, peat, pellets, briquettes with bulk density to 450 kg/m3	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	class 3 EN 303-5	Indoor/outdoor/container	none
Mabre	Dragon NRG	Italy	Air heaters. Water heaters.	25 kW - 4.4MW	<20%	Biomass: olive pits, nuts shells, manure, stone fruit pits, grain, wood chips, wood pellets	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	No EN 303-5 Certification	Indoor/outdoor/container	none
Lin-ka	Dragon NRG	Denmark	Air, water, steam	100 kW -15 MW	Up to 35%	Straw/woodchips/ Pellets/briquettes	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	EN 303-5 for boilers up to 1000kW	Basement, shed, container or under roof.	none



Manufacturer	Importer	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	Boiler Location	Installed in Aust
<u>Granpal Medium (dry)</u>	Dragon NRG	Poland	Water, steam, air (via heat exchanger).	15 kW - 600 kW	up to 25%	Wood chips, sawdust, shredded wood waste, straw pellets, cereal grains, fruit stones, nut shells etc.	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	Class 5 EN 303-5	Indoor/out door/container	none
<u>Granpal Medium (wet)</u>	Dragon NRG	Poland	Water, steam, air (via heat exchanger).	15 kW - 600 kW	up to 50%	Wood chips, sawdust, shredded wood waste, straw pellets, cereal grains, fruit stones, nut shells etc.	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	Class 5 EN 303-5	Indoor/out door/container	none
<u>Granpal Mega</u>	Dragon NRG	Poland	Water, steam, air (via heat exchanger).	800 kW - 7 MW	up to 50%	Wood chips, sawdust, shredded wood waste, straw pellets, cereal grains, fruit stones, nut shells etc.	P45 http://www.woodsure.co.uk/download/P45A_EN_guide_chart.pdf	>500kW	Indoor/out door/container	none
<u>All Power Labs</u>		United States		150 kW	Up to 40%	woodchips	P16 - P45	Not UN303-5 certified	Enclosed shipping container	none
<u>Uniconfort</u>	ACT Group	Italy	Water, steam	200 kW - 30 MW	Various moisture levels	Woodchips, pellets, bark, olive and vine prunings,	P30 - P45. Larger size chips for bigger systems	Class 5 EN 303-5	Indoor/outdoor	none



Manufacturer	Importer	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	Boiler Location	Installed in Aust
Polytechnik	Enrivo	Austria	Water, steam, CHP, air (via heat exchanger).	500kW to 20MW	20% - 60%	Woody biomass, pellets, bark, sawdust	P50	EN 303-5 for container systems	Indoor/ outdoor	5 systems in Victoria and a number in other states
Hargassener	Living energy NZ	Austria	Hot water	3 kW - 800kW	20% - 35%	woodchips, pellets, woodlog	P16 - P45	Class 5 EN303-5	Indoor/ outdoor/ container	Beaufort Hospital
Herz	Heatwise Solutions	Austria	Water, steam, CHP, air (via heat exchanger).	30 kW - 4.5 MW	Up to 35%	Biomatic systems can use either Woodchips or pellets	P16 - P45	Class 3,4,5 EN 303-5		Devonport aquatic centre
Binder	Heatwise solutions	Austria	Water, steam, CHP, air (via heat exchanger).	200 kW - 20 MW	Max 40%	A variety of biomass including seeds, pits, grains, woodchips and pellets	P16 - P31	class 3,4,5 as defined by EN 303-5		Mt Gambier Aquatic centre
Pasqualicchio	McKeeco	Italy	Water, steam	30 kW - 4 MW	Up to 30% and one boiler can take up to 50%	Maize, nut shells, olive pits, olive pomace, wood chips, pellets	P30 - P45	Class 5 EN 303-5	Indoor/ outdoor	none



Manufacturer	Importer	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	Boiler Location	Installed in Aust
Enertech	none	Philippines	Hot water, steam, electricity	1MW to 10MW	Up to 30%	Rice hulls, coconut shells, woodchips, pellets	p20 - p50	Not 303-5 certified	Indoor/ outdoor	
Airtight solutions	Airtight Solutions	New Zealand	Hot water and heat	300 kW to 3 MW		Dust, woodchips, pellets, briquettes	P20	Not UN303-5 certified	Enclosed container	
TFD Biomass boilers	Simons Boilers	South Africa	12 bar steam and hot water	500 kW to 10 MW	Up to 50%	Wood chips, pellets or similar	P45	Not 303-5 certified		
Powermax	none	China	Water, steam, electricity, air	50 kW to 20 MW	?	A large range of biomass material including woodchips and pellets	?	Not 303-5 certified		
Fengyu Group	none	China	electricity generation	30 kW - 15 MW	<15%	Woodchips, sawdust, straw,	P10	Not 303-5 certified	Indoor/ outdoor	None in Aust but installed worldwide
Ankur	none	India	Thermal and electricity	20kW to 2.2MW	Up to 20%	Firewood, woodchips, bamboo, corn, saw mill waste	?	Not 303-5 certified		



Manufacturer	Importer	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	Boiler Location	Installed in Aust
Vincke	JDM Aust	Czech Republic	Steam, hot water and CHP	3 MW - 25 MW	Doesn't specify	Almond hulls, tree prunings, bark, saw trimmings, wood	?	Not 3.5-5 certified		
D'Allesandro Termomeccania	Biesse	Italy	Steam, hot water	100 kW to 4.1 MW	Up to 30% and up to 50% for GM model	Woodchips, pellets, almond husk, olive husks	P50	Class 5 EN303-5 certified		
Justsen	Justsen Pacific	Denmark	Steam, hot water, CHP	1 MW - 20MW	10% to 55%	Wood waste (wet or dry) pellets, briquettes, straw pellets, grains.	<P50	Systems larger than UN303-5 standard	Indoor/ outdoor	Family Fresh Farms, Peats ridge NSW
Volter	none	Finland	CHP	100kW	Up to 20%	woodchips	P16-P30	Not classified as a boiler	Indoor/ outdoor	



3. Current Biomass Installations in Victoria

Currently there are 11 biomass plants operating in Victoria that use woody biomass or grains.



The 11 woody biomass installations supply heat for 3 uses namely steam, hot water and electricity.

Heating hot water	Steam	Electricity
Meredith Dairy	Unigrain Smeaton	Select Harvest Robinvale
Beaufort hospital	Reid Bros sawmill	
Yarragon glasshouse	Select Harvest Robinvale	
Van Wyk flowers		
Gippsland Greenhouse Produce		
HVP Nursery		
Murphy Fresh		
Paarhammer		

Current Biomass Installations in Victoria

Organisation	Importer	Make/Model	Year	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	ROI	Quantities
Meredith Dairy	Dragon NRG	Moderator - Cast iron burner	2017	Poland	Water Air (via heat exchanger)	240kW	<25%	Naturally dried wood chips	Up to 45mm	Class 3 EN 303-5	3.5 years	a large hopper of woodchips per week.
Pyrenees Saw Mill	Dragon NRG	Moderator - Ceramic burner	2015	Poland	Water Air (via heat exchanger)	240kW	<25%	Kiln dried woodchips	Up to 45mm	class 3 EN 303-5	1.3 years	
Unigrain Smeaton	Enertech	Enertech	2004	Philippines	Steam used in the process to extract oats from the hull	3000kW	<20%	Oat hulls	5mm	System >500kW		
Beaufort Hospital	Living Energy NZ	Hargassner	2014	Austria	Water Air (via heat exchanger)	110 kW	<25%	Kiln dried wood chips	P16 - P45	Class 5 EN303-5	12 years	
Yarragon tomatoes	Enriva	Polytechnik	2014	Austria	Hot water provides heat to glasshouse	1600kW	Up to 60%	Wood chips sawdust, bark	Woodchips up to 350mm	System >500kW		84 tonnes of hardwood & 24 tonnes of sawdust p/w



Organisation	Importer	Make/Model	Year	Country	Primary role (heating)	Capacity	moisture	material	Material diameter	EU standards	ROI	Quantities
Gippsland Greenhouse Produce	Enriva	Polytechnik	2014	Austria	Hot water provides heat to glasshouse	2000kW	Up to 60%	Wood chips, sawdust and bark	Wood chips up to 350mm,	System >500kW		Approximately 6000 tonnes annually
HVP Nursery Gelliondale	Enriva	Polytechnik	2009	Austria	Hot water provides heat to glasshouse	1500kW	Up to 45%	Wet pine sawdust		System >500kW		
Reid Brothers Sawmill Yarra Junction		Kohlbach	2005	Austria	Steam for kilns	1000kW	40% - 60%	sawdust, woodshavings, scrap wood		System >500kW	1.3 years	70-80 tonnes of wood wastage per week.
Van Wyk flowers	Envira	Polytechnik	2018	Austria	Hot water provides heat to glasshouse	2950 kW	Up to 45%	Timber residues		System >500kW		
Murphy Fresh Hydroponics	Enriva	Polytechnik	2013	Austria	Hot water provides heat to glasshouse	6000kW	45%	Woodchips chipped onsite		System >500kW	2 years	
Select Harvest Robinvale	Will not disclose		2017		Steam to energy	3000kW		Almond hulls		System >500kW		3.6 tonnes per hour



4. Specifications/Parameters of woodchips

The quality of woodchips is determined by:

- Moisture content
- Tree species
- Quality of the wood itself (rot, mould, contamination)
- Particle size
- The amount of dirt

Moisture Content

Moisture content of biofuel will have an impact on performance, and most boiler manufacturers recommend a biofuel with less than 35% moisture content. A biomass boiler using wet biofuel will use more energy to remove water from the fuel, resulting in lower temperature outputs. For example, a 400kW boiler is likely to generate 250kW of heat using wet biofuel. If you require 400kW of heat from wet biofuel, then a 600kW boiler would be required¹. Upscaling a boiler due to wet biofuel needs to be considered when calculating return on investments.

Condition of wood	Water content	heating value
Fresh timber	50% - 60%	2.0 kWh per kg
Timber stored for a summer	25% - 35%	3.4 kWh per kg
Timber stored for several years	15% - 25%	4.0 kWh per kg

Wood Fuels Handbook, 2015

The table above shows a correlation between heating value and moisture content. Dry biomass fuel generates more energy. With a moist fuel, approximately 50% of the energy is consumed in removing moisture.

It is essential that a client knows the source of biofuel and moisture content before purchasing a biomass boiler. In discussions several manufacturers and importers, biomass boilers are designed to take a biofuel with either high or low moisture levels, and wet and dry biofuel cannot be interchanged or combined. A boiler that accepts a dry biofuel will be manufactured differently to a boiler that accepts wet biofuel. Using woodchips with a moisture content not specified is likely to shorten the life of the boiler and possibly void the boiler warranty.

¹ Lin-ka biomass manufacturer via email

Most manufacturers have alternatives for wet biofuel:

- Manufacture a separate model with ceramic heads that accepts wet biofuel. For example, Moderator, Granpal or;
- Modify existing biomass models with ceramic inserts during manufacture. For example, Polytechnik, Uniconfort

Ceramic heads will help to maximise temperatures from wet biofuel. On a site visit to Reid Brothers Sawmill in Yarra Junction, staff would 'hose down' dry biofuel before it's placed in the hopper, otherwise the boiler became too hot.

Moisture Content and Particle Emissions (PM_{2.5})

There is a correlation between moisture levels in biomass fuels and increased particle emissions. The research below measures Eucalyptus Globulus (blue gums) and compares the PM_{2.5} from wood with 0% moisture and 25% moisture.

Increasing wood moisture in combustion tests decreased combustion efficiency (93% to 49%) and increased the emission factors of total PAHs (5215.47 ng g⁻¹ to 7644.48 ng g⁻¹), the gravimetric PM_{2.5} (2.01 g kg⁻¹ to 22.90 g kg⁻¹) and the total number of measured micrometer-sized particles (3.15 × 10¹² particles kg⁻¹ to 1.33 × 10¹³ particles kg⁻¹) due to incomplete combustion.

Biomass installations can install filters to minimise emissions. [Oekosolve filters](#) are fine dust filters that attach to the flue to reduce particle emissions. Oekosolve can be installed on biomass systems up to 3MW.

<https://www.sciencedirect.com/science/article/pii/S0048969718330250>

Tree Species for Biomass heating

There is minimal difference in calorific value between various types of hardwoods and softwoods. Both Eucalyptus and Radiata pine are recommended woods for biomass boilers. There are differences in the weight of Eucalyptus and pine per m³. Meredith Dairy had an equipment breakage from using eucalyptus in a Moderator hopper. The hopper was designed for softwoods which are significantly lighter and the weight of a hopper filled with eucalyptus was too heavy for the rotating feeder and broke. This has subsequently been fixed and hoppers are now designed to accept the additional weight of eucalyptus hardwoods.

- 27m³ of softwood in the hopper = 6.75 tonnes
- 27m³ of hardwood in the hopper = 10.8 tonnes

- <https://bioenergyvictoria.net.au/files/Small%20scale%20thermal%20bioenergy%20systems%20-%20Shaun%20Quayle%20-%20Ararat%202107%20.pdf>



Heating Value of Wood Pellets from various Species

Species	Heating Value (MJ/kg)	Moisture
Maritime pine	20,237	10.3%
Blue Gums (globulus)	17,631	11.5%
Douglas fir (conifer)	19660	8.8%
Atlas Cedar	20,360	17.8%
Sweet chestnut	18,754	11.1%
European beech	19,132	11.5%
English oak	18,696	11.4%
Narrow leafed ash	19,090	7.3%
Sweet cherry	18,256	8%
Weeping willow	18,279	9.2%
Canadian poplar	18,791	7.5%
Sycamore maple	18,637	9.7%
Milicia excelsa	20,314	8.8%
sapele	19,053	11.4%
Priora balsamifera	20,499	10.3%
Bowdichia	20,809	8%
Stingingtoe	19,296	9.8%

https://www.researchgate.net/profile/Jose_Louzada/publication/233726394_Heating_values_of_wood_pellets_from_different_species/links/59f76804a6fdcc075ec7b699/Heating-values-of-wood-pellets-from-different-species.pdf?origin=publication_detail

The table above compares the calorific/heating value of wood pellets from various tree species. Blue Gums (*Eucalyptus Globulus*) are on the lower end of the scale but still have adequate calorific value for biomass systems. Blue gums are planted throughout the world for biofuel due to their fast growth rates and ability to withstand poor soil quality.



Woodchip Particle Size

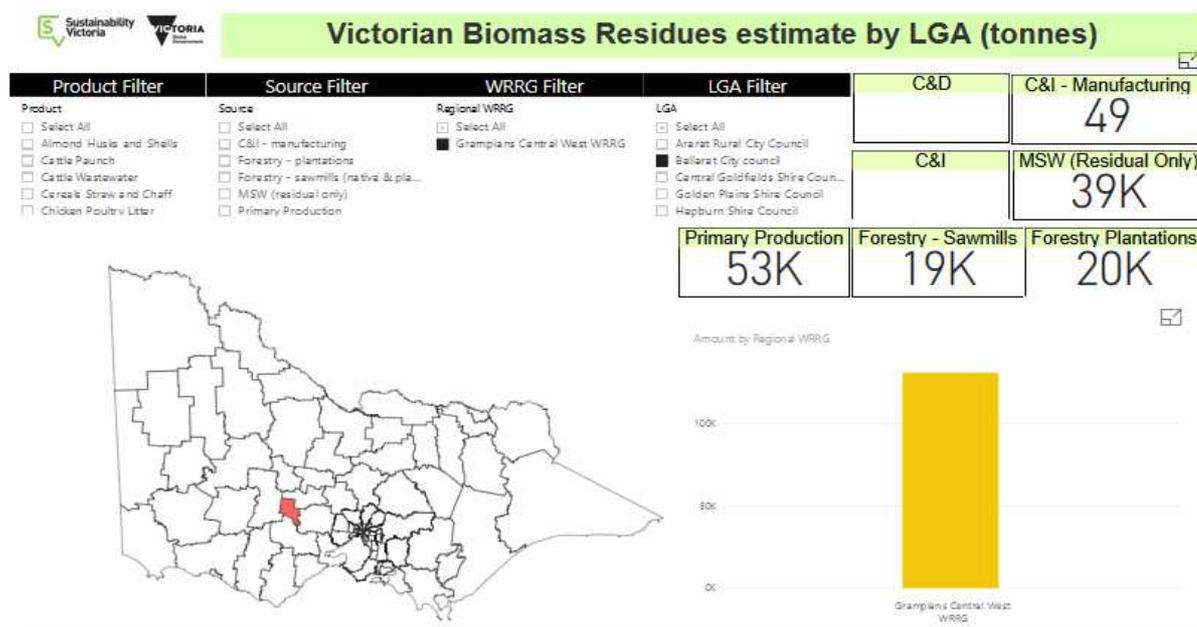
In general terms, larger biomass boilers accept a wider range of woodchips sizes and smaller boilers will specify a smaller size range. The standard woodchip size from the 21 biomass manufacturers is between 20mm - 50mm diameter. Woodchips above specification size risk jamming the auger and stopping the feed of biofuel. One manufacturer (Uniconfort in Italy) manufacture larger auger feeding systems that accept up to 250mm dimensions.

On a site visit to Meredith Dairy, the woodchips varied greatly in size and there were some long skinny pieces (up to 300mm) moving through the auger. Richard Paton from Meredith Dairy said these longer pieces often snapped in the auger. There has been one instance since installation at Meredith where an oversized woodchip jammed the auger.

5. Biomass Fuel Supply in Regional Victoria

The City of Ballarat region has an abundance of biomass fuels. Data modelling from the Australian Biomass Bioenergy Assessment (ABBA) in 2014-15 found 180,000 tonnes of organic waste being generated in the City of Ballarat region annually including:

- 19,000 tonnes of wood waste from sawmills each year
- 49,000 tonnes of wood waste (C&I) from landfill sites each year
- 39,000 tonnes of organic waste (MSW) each year
- 20,000 tonnes of wood waste from forestry plantation residue each year
- 53,000 tonnes of primary production waste (straw/chaff) each year



<https://www.sustainability.vic.gov.au/Government/Victorian-Waste-data-portal/Interactive-waste-data-mapping/Victorian-Biomass-Dashboard>



Biomass Suppliers:

Cleanaway receives 500 tonnes of waste wood per month. About two thirds of the waste wood is clean and suitable for chipping. Cleanaway are in discussions to employ a spotter who will separate clean wood from contaminated wood when it arrives at the recycling station. The wood supply is located in Brooklyn (western suburbs of Melbourne). Woodchip delivery via a semi-trailer with a walking floor. 80 metres of woodchips can be delivered per trip. Delivery costs is \$1,080. (80 metres would equate to 20 tonnes using KKC conversion of 5 m³ to 1 tonne). A slow speed chipper has magnets to attract nails and other metals. Total price delivered is \$97 per tonne.

Botanical Resources Australia (BRA) have been trialling the production of biofuels in pellet form. To date they have manufactured pellets from crop residue, hard wood, Lucerne, straw and almond hulls in small quantities. The pellets have a low moisture content (<12.5%). BRA doesn't have equipment to manufacture pellets on a large scale but would consider an investment if there was demand and/or contracts for the supply of biomass fuel. Manufacturing costs are between \$50 - \$100 per tonne depending on the supply of raw material.

Straw Alliance is a collective of grain growers in regional Victoria who are looking to purchase a cropping machine which processes crop stubble into straw pellets. The [Krone Premos 5000 pellet harvester](#) could possibly be on the market by 2020. Estimated costs to be \$110 per tonne for straw pellets. This price includes transport to the biomass site where or within a 120km radius of the farms. The pellets will have a low moisture content that will provide additional heat per kg of fuel and reduced emissions.

HPV have contracted out their logwood and woodchips to SPE in Geelong.

SPE in Geelong accept all wood from HPV. The wood is radiata pine and 85% of the woodchip diameter is between 9mm and 28mm, 9% is between 3mm and 9mm and 5% is over 28.5mm. The moisture content of the woodchips is close to 50%. SPE sell woodchips to the public and prices delivered to Ballarat is \$88 per tonne.

Pyrenees Sawmill charge Beaufort Hospital \$140 per tonne delivered. Prices for delivery to Ballarat would be approximately \$170. The size of their wood chips is 25mm and the moisture levels are less than 30%.

Ballarat Landscape Supplies (Wiltshire Lane) have a large stock of woodchips from the removal of cedar/pine trees in the region. Their supply isn't constant and BLS couldn't supply woodchips on a regular basis. The woodchips have a moisture content up to 50% and diameter between 20mm - 50mm. BLS could negotiate with a biomass user who has capacity store a large quantity of woodchips. BLS are selling their current stock of woodchips for \$20 per m³ which equates to \$100 tonne (using KKC's conversion rate) delivered to Ballarat.

Central highlands Water has radiata pine and native plantations throughout regional Victoria. The wood is currently contracted to a sawmill for the next 4 years but there is opportunities to chip the



clear fell wood that is remaining once the trees are removed. A biomass owner would be required to employ a wood chipping organisation to chip and deliver. CHW would charge a fee for making their land available. Eg \$10 - \$20 per tonne.

Tony Coxall “Ballarat Tree Fella” sells excess woodchips to households for mulch.

Ballarat Regional Industries could supply up to 30 tonnes of woodchips per week. BRI woodchips is a combination of hardwood and softwood with moisture levels less than 30%. The raw material is sourced from used shipping pallets and offcuts from manufacturing new shipping pallets. The wood chipper uses magnets to collect nails and any contaminated wood would be sorted and removed prior to chipping. Price would be negotiated closer to starting and the price would include delivery.

KKC Recycling receive 20,000 m³ of wood annually. The wood is graded (grade 1 & 2) by staff as it enters the recycling station, there are separate piles for each grade. Grade 1 is clean wood that is suitable for biomass combustion. The wood is 90% pine and 10% hardwood and is mainly housing frames and shipping pallets. The moisture content is less than 20% and woodchip diameter is 10mm to 35mm. There are two stages where nails are captured, magnets in the grinding belt and magnets also on the screening unit. Cost is \$15 per m³ delivered which equates to \$75 per tonne delivered. Delivery via a 100 metre semi-trailer with a walking floor.

Supplier	Quantities available	Manufacturing cost	Cost per tonne	Delivery included in price	Seasonal or constant supply	Moisture levels	Comment
Cleanaway	300 tonnes per month	\$47 per tonne chipping	\$97	yes	constant	dry	
Straw Alliance			\$110	yes	seasonal	dry	Straw pellets. Established within 1-3 years
KKC Recycling	1,500 tonnes annually		\$75	yes	constant	dry	Can negotiate lower if required
Botanical Resources		\$50 - \$100	TBA		constant	dry	Pelletise a range of products
Ballarat Landscape Supplies			\$100	yes	seasonal	wet	Woodchips sourced from tree removalists
Ballarat Regional Industries	30 tonnes per week		TBA	yes	constant	Dry	Price to be negotiated
SPE Geelong			\$88	yes	constant	wet	
Pyrenees Sawmill		\$140 tonne	\$170	yes	constant	<30%	Delivered Size P25



6. Quality Assurance of Biofuel

Quality assurance of woodchips is vital for optimal performance. Using a biofuel that is outside the manufacturer's specification will alter heat output, emissions and potentially damage the boiler.

This topic is covered by the European standard EN 15234-4 Fuel Quality Assurance - wood chips. A copy of this standard is attached. This standard covers processes from raw material supply to production and distribution to the customer.

The diagram on page 24 demonstrates the quality assurance requirements for EN 15234. This label would be displayed on a bag of wood pellets and the label will detail the pellets country of origin, the wood species, moisture content, calorific value, ash content and emissions.

Standard EN 15234-4 only applies to European production of woodchips or European imports of woodchips. This standard does not apply to the production of woodchips in Australia and there are no standards that relate to the quality assurance of woodchips in Australia.

Current Biomass Systems in Victoria

Biomass Facility	Biofuel Supplier
Meredith Dairy	Supply their own biofuel
Pyrenees saw mill	Supply their own biofuel
Unigrain Smeaton	Supply their own biofuel
Beaufort Hospital	Dry biofuel from a sawmill
Yarragon Glasshouse	Wet biofuel from nearby sawmill
Gippsland greenhouse produce	Wet biofuel from nearby sawmill
HVP Nursery Gelliondale	Wet biofuel from nearby sawmill
Reid Brothers sawmill	Supply their own biofuel
Van Wyk Flowers	Wet biofuel from nearby sawmill
Murphy Fresh	Wet biofuel from nearby sawmill
Select Harvest Robinvale	Supply their own biofuel

The chart above lists the installed biomass boilers in Victoria and their biofuel supplier. Over half of the installed systems use their own fuel and the remainder source woodchips from a nearby sawmill. You could argue that existing biomass installations in Victoria do have a quality assurance



as they know the raw material going into the chipper, how it's manufactured into chips and distributed to their site.

Sourcing woodchips from recyclers (KKC, Cleanaway, Calleja, BRI) does have risks as the raw material includes nails, paints, treated wood or combining dry wood with wet wood. Each recycler has processes to eliminate/minimise contaminants, but quality assurance will need to be monitored from waste recyclers.

Sourcing a biofuel from the Straw Alliance or Pyrenees Sawmill will cost considerably more but you'll have an assurance on the quality of the biofuel and the low moisture levels will increase performance. The downside is the higher costs will increase the return on investment on the biomass system.

7. Biomass Standards

Below are summaries of the International, European and Australian Standards that impact on Australian organisations purchasing biomass boilers and biofuels.

International/European Standards

International Organisation for Standardisation (ISO) has comprehensive standards for biofuels. These standards have been adopted and broadened from the European Nation standards (EN). These standards are classed under [ISO/TC 238 Solid Biofuels](#). Australia is a member of ISO.

It is important to note the standards apply to biomass systems up to 500kW. All boilers above 500kW are considered 'Industrial'.

The main standards that apply to Australian producers and consumers are:

ISO 16559 terminology, definitions and descriptions

ISO 17225 specifications and requirements

EN 15234 Quality assurance

EN 303-5 Heating Boilers using biofuel

ISO 16559 Biofuel Definitions

This standard defines the following biofuels:

- **Wood chips:** chipped woody biomass in the form of pieces with a defined particle size produced by mechanical treatment with sharp tools such as knives



- **Hogfuel:** Fuelwood that has pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers or flails
- **Wood pellets:** biofuel made from woody biomass with or without additives in the form of cubiform, polyhedral, polyhydric, or cylindrical units, random length and typically 3.15mm to 40mm, a diameter up to 25mm and with broken ends
- **Wood briquette:** biofuel made with or without additives in the form of cubiform or cylindrical units and a diameter of over 25mm produced by compressing pulverised woody biomass
- **Firewood:** cut and split fuelwood usually with a length of 20 to 100cm used in household appliances like stoves, fireplaces and central heating devices.

ISO 17225 Solid Biofuels

17225 is the most relevant standard to Australia as it describes the origin of the fuel type and quality fuel classes are given for wood pellets, wood chips, briquettes, thermally treated wood and olive stones. The standard for woodchips is ISO 17225-4. ISO 17225 will provide quality requirements for non-industrial <500kW and industrial >500kW. Smaller biomass boilers will have more stringent requirements for ash content, moisture and diameter sizes of the product.

ISO 17225 - 4 provides quality requirements for wood chips with detailed information on moisture content, woodchip size and ash content as shown in attached file ISO 17225 - 4 table 2, page 5. Woodchips are placed into A and B classes, property classes A1 and A2 represent virgin wood and chemically untreated wood residues. A1 fuel will have a lower ash content indicating no or little bark while class A2 will have slightly higher ash content and/or moisture content. Class B1 will include chemically untreated wood from industrial by-products. Class B2 includes chemically treated industrial by products and used wood. The wood must not have harmful chemicals or heavy metals.

The moisture content more or less dictates the kind of boiler in which the chips can be used. Small boilers need a dry fuel, while the larger boilers can often work with a higher moisture content.

EN15234-4 Fuel Quality Assurance - woodchips

The aim of this standard is to provide confidence to the end user that the product has been appropriately sourced, manufactured and transported. This standard has subsets for the quality of pellets, logwood, and woodchips. A copy of standard EN15234-4 is included.



 Wood pellet	Producer	EAA Biofuels, Box 1603, FI-40101 Jyväskylä Tel. +358 20 722 2550 E-mail: info@eaabiofuels.com
	Origin and source	1.2.1.2 Wood without bark (sawdust)
	Traded form	Pellet
	Country and location	Jyväskylä, Finland
	Normative (EN 14961-2) Class A1	
	Dimensions (mm) Diameter (D) and length (L)	D08 (8 mm ± 1mm, and 3,15 ≤ L ≤ 40 (99%), all ≤ 45 mm)
	Moisture (w-% as received)	M10 (≤ 10 w-%)
	Ash (w-% dry basis)	A0.7 (≤ 0,7 w-%)
	Mechanical durability	DU97.5
	Fines (w-%, < 3.15 mm)	F1.0 (1 w-% at factory gate when loading)
Additives (w-% of pressing mass)	< 1 w-% (starch)	
Net calorific value as received	Q4.7 [kWh/kg]	
Bulk density (kg/m³)	600 (≥ 600 kg/m ³)	
Nitrogen (w-% of dry)	N0.3 (≤ 0,3 w-%)	
Sulphur (w-% of dry)	S0.03 (≤ 0,03 w-%)	
Chlorine (w-% of dry)	Cl0.02 (≤ 0,02 w-%)	
Arsenic (mg/kg dry)	≤ 1 mg/kg	
Cadmium (mg/kg dry)	≤ 0,5 mg/kg	
Chromium, (mg/kg dry)	≤ 10 mg/kg	
Copper, (mg/kg dry)	≤ 10 mg/kg	
Lead, (mg/kg dry)	≤ 10 mg/kg	
Nickel (mg/kg dry)	≤ 10 mg/kg	
Mercury (mg/kg dry)	≤ 0,1 mg/kg	
Zinc (mg/kg dry)	≤ 100 w-%	

One requirement of EN 15234 is for the biofuel manufacturer to provide a fuel product declaration. The declaration specifies the wood product used and code according to ISO 17225, the country the wood was sourced from, biofuel type (pellet), the class, pellet dimension, moisture, durability etc.

EN 303-5:2012 heating boilers using solid fuel

- EN 303-5 applies to biomass boilers up to 500kW. There are no UN standards for boilers above 500kW however some manufacturers continue to apply the UN303-5 standards to boilers over 500kW.
- EN 303-5 contains standards for the manufacture of the biomass unit including pressure levels, welding standards, wall thickness, max water temperature, combustion efficiency, operation and maintenance of boilers. See attached standard EN 303-5 pages 19 -27
- boiler safety requirements. See standard EN 303-5 Pages 28 onwards
- Boiler efficiency. See standard EN 303-5 section 4.4.2
- Boiler emissions of CO₂, particles PM_{2.5}, PM₁₀ and organic gaseous compounds (OGC'S). Emissions are classed from 3 to 5 with 5 being the lowest emitter. See standard EN 303-5 table 6 page 38



The Beaufort hospital, Meredith Dairy and Pyrenees Sawmill boilers are UN 303-5 compliant. Other installations installed in Victoria are over the 500kW limit.

Australian Standards

There is limited information on biomass boilers with Australian and New Zealand (AS/NZS) standards focussing on solid fuel combustion heaters. Federally, there is a report on [wood heater particle emissions and operating efficiency standards](#) and this report doesn't specifically mention biomass systems.

EPA - Victoria

The principal concerns about emissions and the impact of combustion systems on air quality are in relation to carbon dioxide, carbon monoxide, particles smaller than 10 microns and 2.5 microns PM₁₀ and PM_{2.5}), oxides of nitrogen and sulphur dioxide. These emissions are covered in Environment Protection Act 1970.

EPA has prepared guidelines for all '[Energy from Waste](#). Key highlights:

- The Victorian EPA excludes waste to energy systems below 3000kW thermal capacity or 1,000kW of electrical power (A08, page 2), a system < 3000kW is not deemed a scheduled premise under Environmental Protection (scheduled premises) regulations 2017
- Guidelines Accept the following fuels as limited risk and accepted feedstock (page 4):
 - biomass from agriculture,
 - residues from plantation forestry and sawmilling operations,
 - untreated wood and
 - vegetable residue from virgin pulp production and production from paper from pulp
- Waste fuel must be uncontaminated and relatively homogenous (page 4)
- Waste must have a minimum gross calorific value of 10MJ/kg. Eucalyptus and softwoods is 18-20MJ/kg
- Plants must meet local planning and zoning requirements applicable to the facility (page 5)
- Emission discharges, under both steady and non steady state operating conditions, meet all the emissions standards set in the European Union's Waste Incineration Directive 2000/76/EC



- (WID), which was recast into the Industrial Emissions Directive 2010/75/EU (IED). The IED sets stringent emission limits and monitoring requirements which include:
 - continuous emissions monitoring of total particulate matter (TPM); sulfur dioxide (SO₂); oxides of nitrogen (NO_x); hydrogen chloride (HCl); carbon monoxide (CO); total organic carbon (TOC); hydrogen fluoride (HF)). In addition, there must be at least non - continuous air emission monitoring of other pollutants such as heavy metals, dioxins and furans, a minimum of two measurements per year, which should be more frequent during the initial operation of the plant. This monitoring should capture seasonal variability in waste feedstock and characteristics.
 - Additionally, in order to guarantee complete combustion, the IED requires all plants to keep the combustion or co-combustion gases at a temperature of at
 - least 850 °C for at least two seconds after the last injection of air. If waste with a content of more than 1 per cent of halogenated organic substances, expressed as chlorine, is combusted, the temperature must be raised to 1,100 °C for at
 - least two seconds a after the last injection of air

If the system is 3000kW and higher:

- Need to submit a [Works Approval Licence](#)

EPA Noise

A works approval is not required with respect to emissions of noise from a source emitting less than 80dB(A) sound power level under Environmental Protection (scheduled premises) regulations 2017

OH&S Standards

A monitorable Occupational Health & Safety (OH&S) Management Plan is required to ensure the projected OH&S outcomes will be achieved. An environmental monitoring program should also be instigated to demonstrate commitment to responsible environmental management of the project.

Pressure Vessel standards

If you import a biomass unit that produces steam, there will be additional standards to comply with. AS/NZS 1200 and AS/NZS 4343 apply to pressure vessels. The importer will need acquire the boiler designs from the manufacturer and get them certified. This process costs approximately \$5,000 and would be carried out by the importer as part of the importation process. In addition to this process, you will also be required to register the pressure vessel with Worksafe Victoria.



National Pollution Inventory (NPI)

<http://www.npi.gov.au/>

The National Pollution Inventory requires mandatory annual reporting on emissions once you reach a specified threshold. NPI has a list of 93 substances that are listed for reporting. Below I've listed the substances emitted by biomass boilers and the reporting thresholds.

substance	NPI Reporting threshold
Nitrogen	400 tonnes per year or 1 tonne per hour
sulphur	10 tonnes per year
Chlorine	10 tonnes per year
arsenic	10 tonnes per year
Cadmium	10 tonnes per year
chromium	10 tonnes per year
Copper	10 tonnes per year
Lead	10 tonnes per year
nickel	10 tonnes per year
Mercury	5 kilograms per year
zinc	10 tonnes per year
Particulate matter	400 tonnes per year or 1 tonne per hour
Total volatile organic compounds	25 tonnes per year



8. Biofuel from Native State Forests

It's unlikely that biomass sourced from native forests managed by DELWP and Parks Victoria will be encouraged. In conversations with Timothy Hudsmith, Program Manager Community and Partnerships, DELWP support the biomass industry but don't allow DELWP managed parks to participate in commercial forestry and are not in a position to supply woodchips. Parks Vic hold a similar position.

As part of the Victorian Renewable Energy Target (VRET) the Renewable Energy ACT 2017 was re-gazetted in June 2018 preventing biomass from a native forests being classed as renewable energy.

The Federal Government permits biomass from native forests to be deemed renewable energy as part of the Renewable Energy Target (RET) but there are limitations. The restrictions are listed under the Renewable Energy (electricity) regulations 2001

- “a by-product or waste product of a harvesting operation, approved under relevant Commonwealth, State or Territory planning and approval processes, for which a high-value process is the primary purpose of the harvesting; or
- a by-product (including thinnings and coppicing) of a harvesting operation that is carried out in accordance with ecologically sustainable forest management principles”
- It's unlikely DELWP and Parks Vic will conduct harvesting operations in Victorian forest so for the purposes of this report, biomass from native forests will not be deemed renewable energy.

9. Outstanding Questions Table

Organisation	Question(s)
Meredith Dairy	<ol style="list-style-type: none">1. What is the make/model and size of the wood chipper that you have purchased?2. Are the woodchips stored undercover and or on/off the ground?3. Does Meredith Dairy moisture test a sample of woodchips before putting them into the hopper unit?4. Do you notice a reduction in performance if you use a woodchip with a higher moisture content
Suez (waste and recycling)	Requested a price to chip current wood supply and deliver to a Ballarat location
Calleja Transport	Requested a price to chip current wood supply and deliver to a Ballarat location
Powermax boilers	Requested woodchip moisture levels and woodchip diameter preference



10. References

International Biofuel Standards

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Questionnaire about Biomass Gasification Power Generation

1. Feedstock you used for biomass power plant: _____

In case of wood, the type/name of the wood/tree: _____

Please provide fuel industrial analysis report if you have (such as caloric value, volatile matter, fixed carbon and ash content, ash fusion point.) :

2. Available area for biomass power plant : m². Length: m; Width: m

3. Constructions description within 50 meters radius around power plant (School? Hospital? Residential area...?)

4. Distance to outer power supply: ___meters, Voltage:___; Cycle:___Hz

5. How many KWh electricity you need per hour ? _____

24/7 hours operation or 8 hours per day? _____

Besides power generation, do you have any other specific requirement for this system?

6. Feedstock characteristic:

Granularity minimum: _____mm; Granularity maximum: _____mm

Granule less than 10 mm: _____%, Moisture content: _____%

Daily supply quantity: _____ ton/day

7. Do you have crushing equipment which can make feedstock length or diameter less than 10mm (to cut big size into small size)? _____

Do you have dryer which can make the feedstock moisture content less than 15%? _____

8. Location of project construction:

Downtown or Suburb or Outer suburb? _____

9. Construction site add.: _____

10. Average relative humidity _____,

11. **Average temperature** _____ °C

Highest temperature and months _____ °C _____

Lowest temperature and months _____ °C _____

12. **Altitude** _____ meters, **Atmospheric pressure:** mmHg

13. Local electricity rate for industrial use (USD/KWh): _____

14. Purchasing price of biomass fuel material (USD/ton): _____

15. Do you need CE for the import of the Biomass Power Plant? (Note: CE certificate normally required by EU countries) _____
16. Any additional information about your project, such as, when is this project scheduled to be set up or installed? **Are you the end user(buyer) or agent for this project?**
17. May I know how you would like to finance your project? At your own expenses or bank loan? Normally, how long will it take for your bank to release the fund after you submit all the documents for approval? Please advise,thanks!

18. Besides Alibaba, may I know how you knew the information about our company and product? From Google, Yahoo or other search engine/B to B platform, please advise, thanks!

Thanks for your time & answers.