



Biomass Energy Systems

By: Sohum Gandhi, GM Energence

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sohum@energence.com.au



Presentation Overview

- Carbon Neutrality
- What is Biomass
- Project Evaluation
- Economic Return
- Trending Technology
- Australian Examples



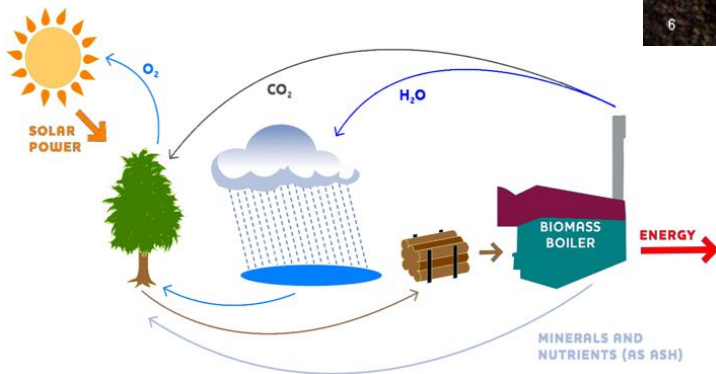
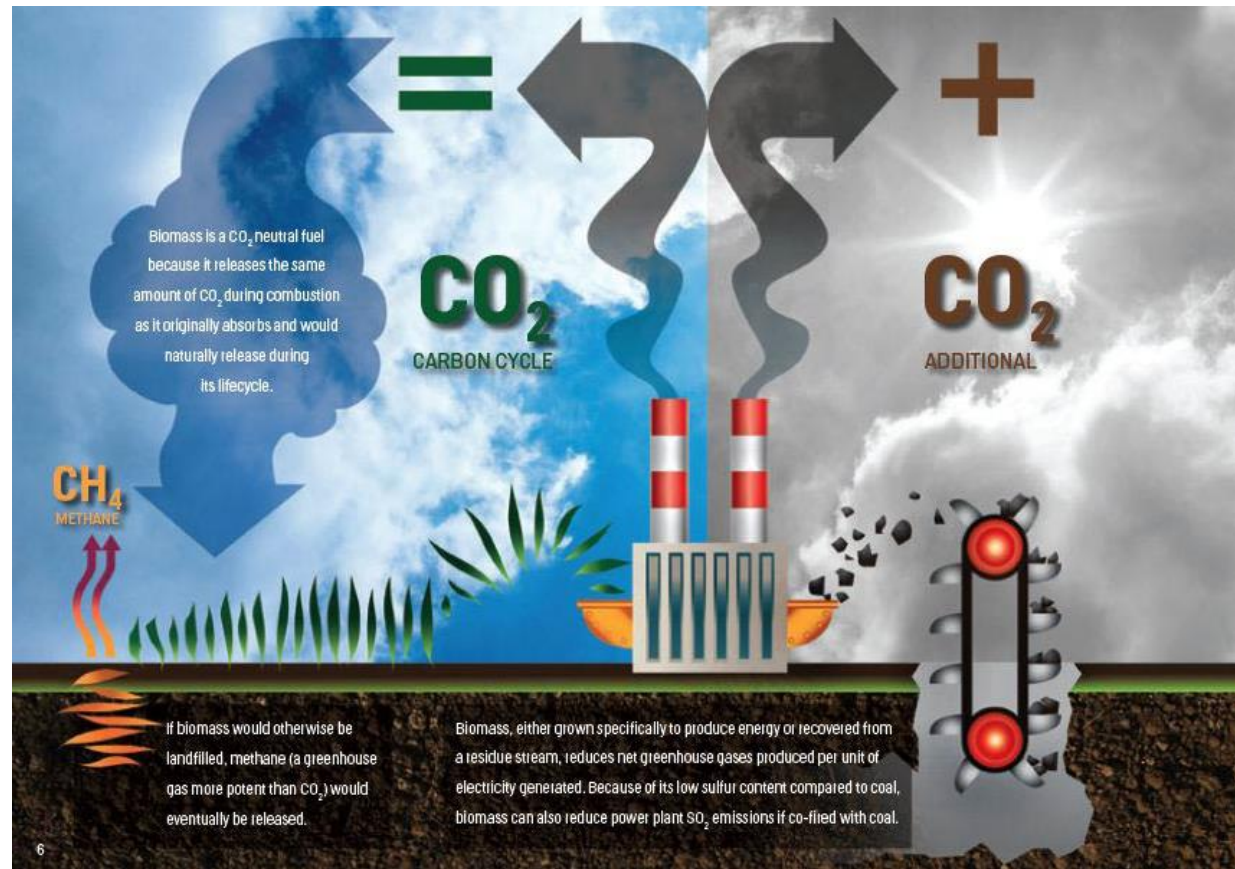
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Carbon Neutrality

- Carbon is everywhere
- Where does the energy come from?
- Accepted concept –
Nationally / Internationally



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Recognition (Positions of governments and associations)

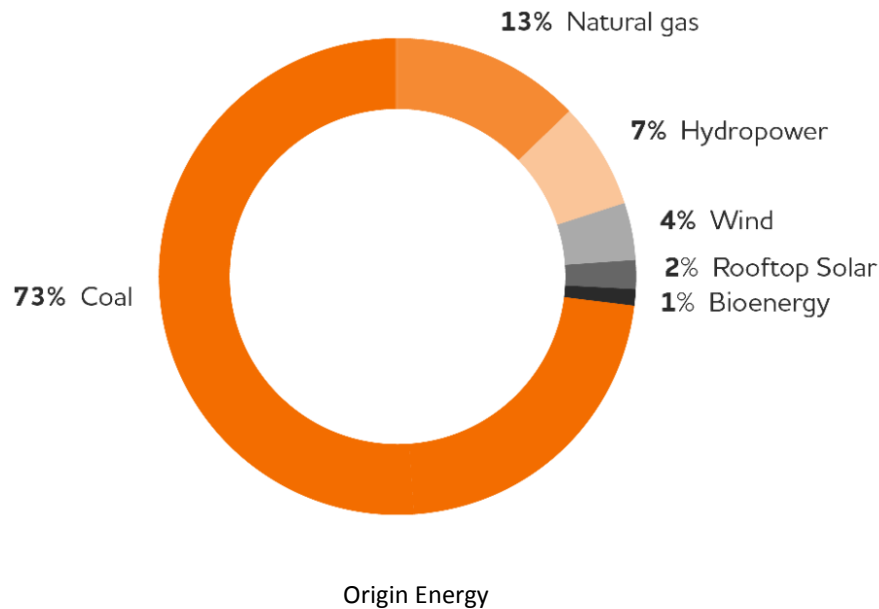
- National Greenhouse Accounts Factors (AUS Fed Government, Department of Environment)
- World Bioenergy Association *“Biomass is a carbon-neutral energy source, because the plants absorb CO₂ from the atmosphere via photosynthesis and this carbon is eventually released to the atmosphere via the decay of biomass or by using it. Biomass in forests can be harvested while at the same time the carbon stock in the forest is increasing, ensuring a carbon-neutral source of renewable energy.”*
- IEA (International Energy Agency)
- United Nations Framework Convention on Climate Change (UNFCCC)/Kyoto Protocol



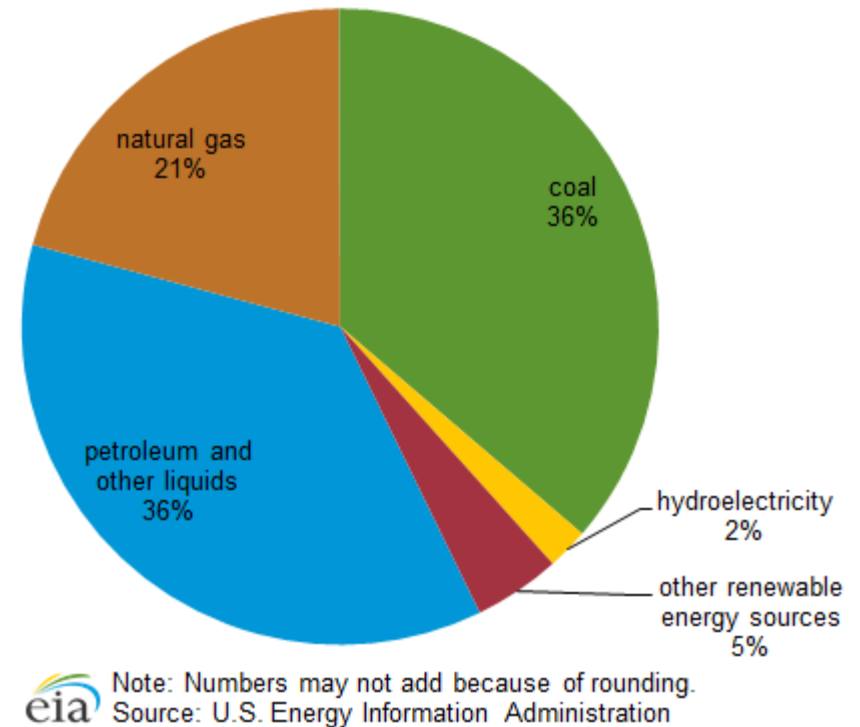
Australia's Energy Mix

- Big fossil fuel players
- Electricity consumption per capita 230 GJ/annum (top 20)

ELECTRICITY GENERATION ACROSS AUSTRALIA



Australia's primary energy consumption, 2012





Types of Biomass

Parameters;

- size profile
- moisture content
- Calorific
- ash content
- ash melting point

Categories

- Forestry residues
- Fruit Pits
- Nut Shells
- Manufacturing / Processing residues





WOOD PELLETS



WOOD BRIQUETS



WOOD SHAVINGS



SAWDUST



WOOD CHIPS



PEELINGS



SHREDDED TIMBER



HOG FUEL



FOREST RESIDUES



BARK



PEAT



CONSTRUCTION &
DEMOLITION WOOD



MISCANTHUS



NUT SHELLS



CHICKEN LITTER

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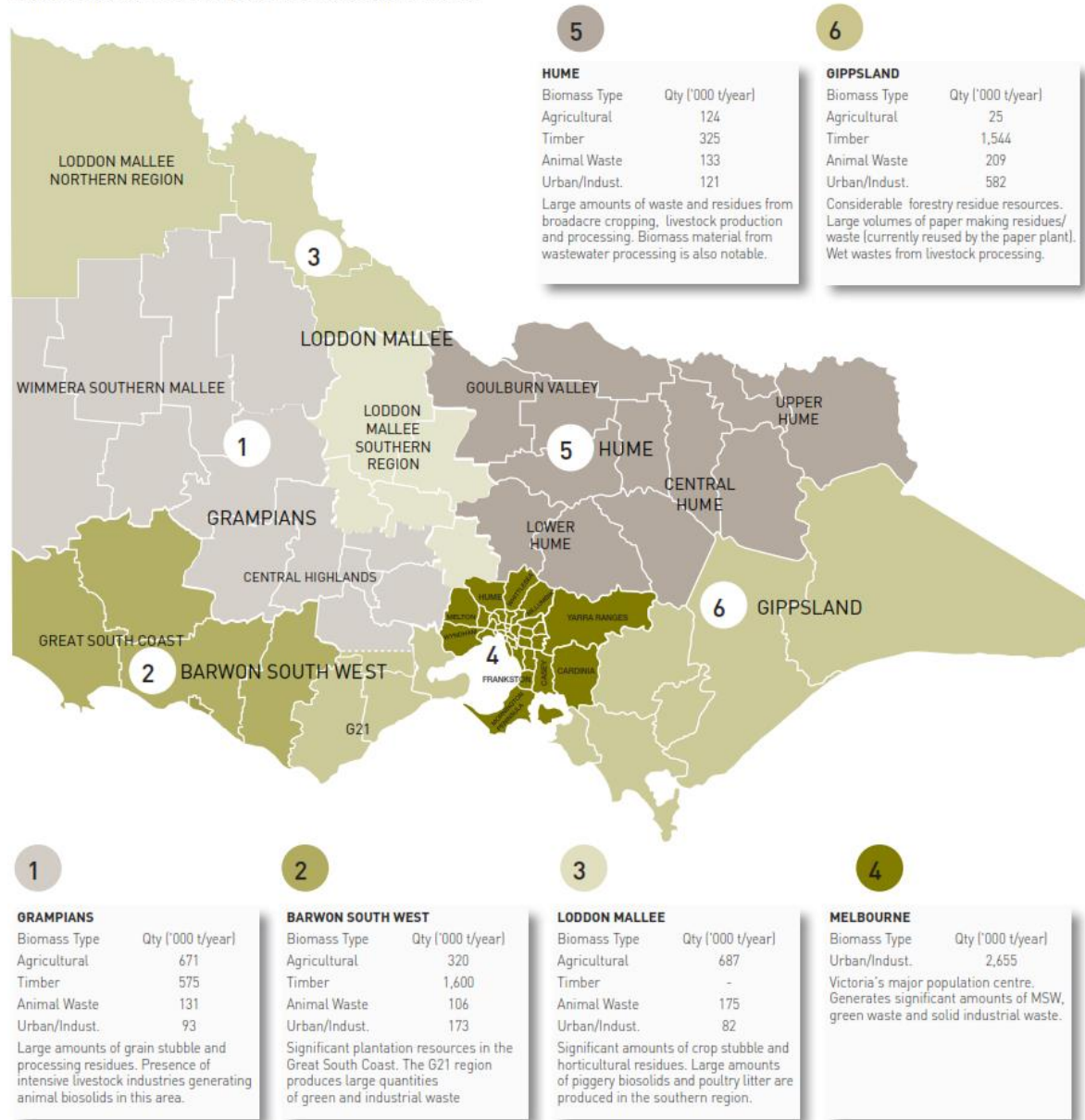
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Figure 6: Indicative summary of biomass throughout Victoria

Quantity?

- Vic government – fuelled for growth
- Millions of tonnes of residues



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Project Evaluation

- Fuel (energy) sources
- Energy costs
- Energy requirements / Load Profile



- Energy medium (hot water, steam, electricity)

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Economic Return

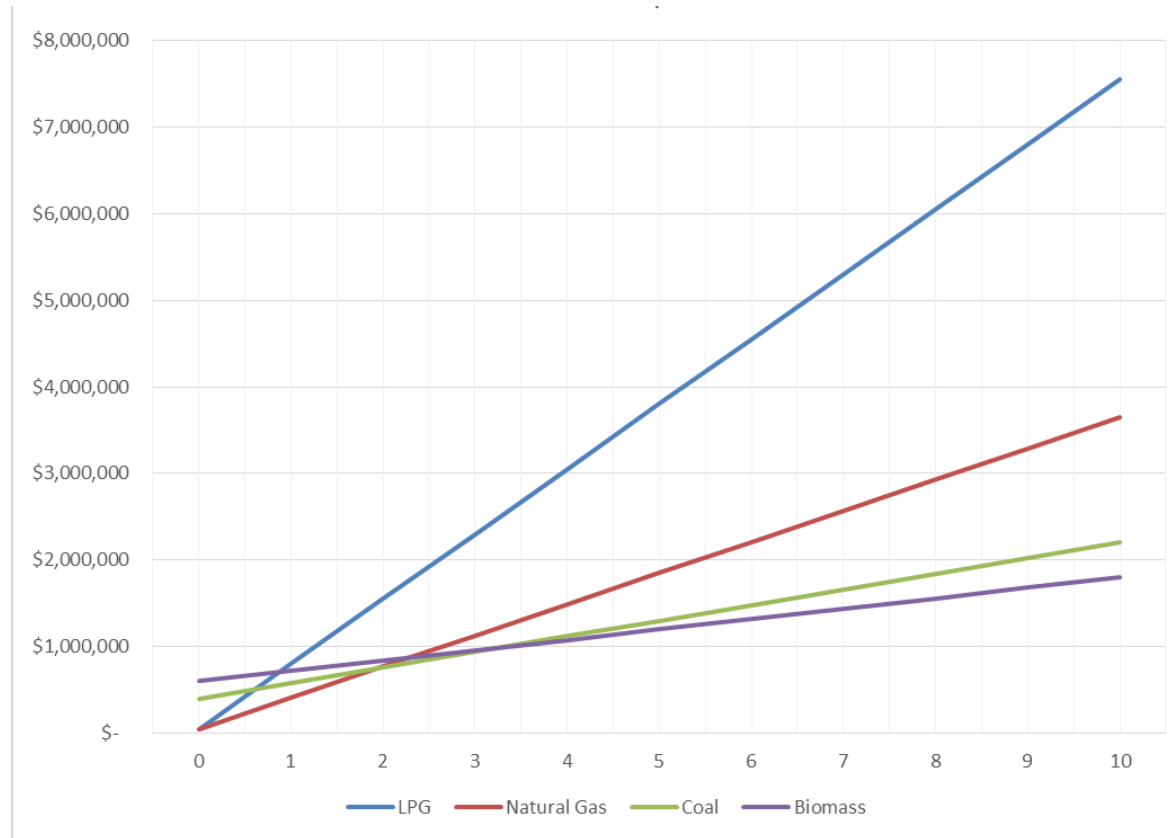
- Forget everything we have covered
- In the real world does this project stack up?
- Capital cost
- Running cost
- Carbon emission rebates



Cost Comparison Chart

<i>Fuel Type</i>	<i>Cost/GJ</i>	<i>Annual Energy Usage (GJ)</i>	<i>Annual Energy Cost</i>	<i>Capital</i>	<i>10 Year Cost</i>
LPG	\$ 25.00	30,000	\$ 750,000	\$ 50,000.00	\$ 7,500,000
Natural Gas	\$ 12.00	30,000	\$ 360,000	\$ 50,000.00	\$ 3,600,000
Coal	\$ 6.00	30,000	\$ 180,000	\$ 400,000.00	\$ 1,800,000
Biomass	\$ 4.00	30,000	\$ 120,000	\$ 600,000.00	\$ 1,200,000

Indicative figures only for comparison purposes



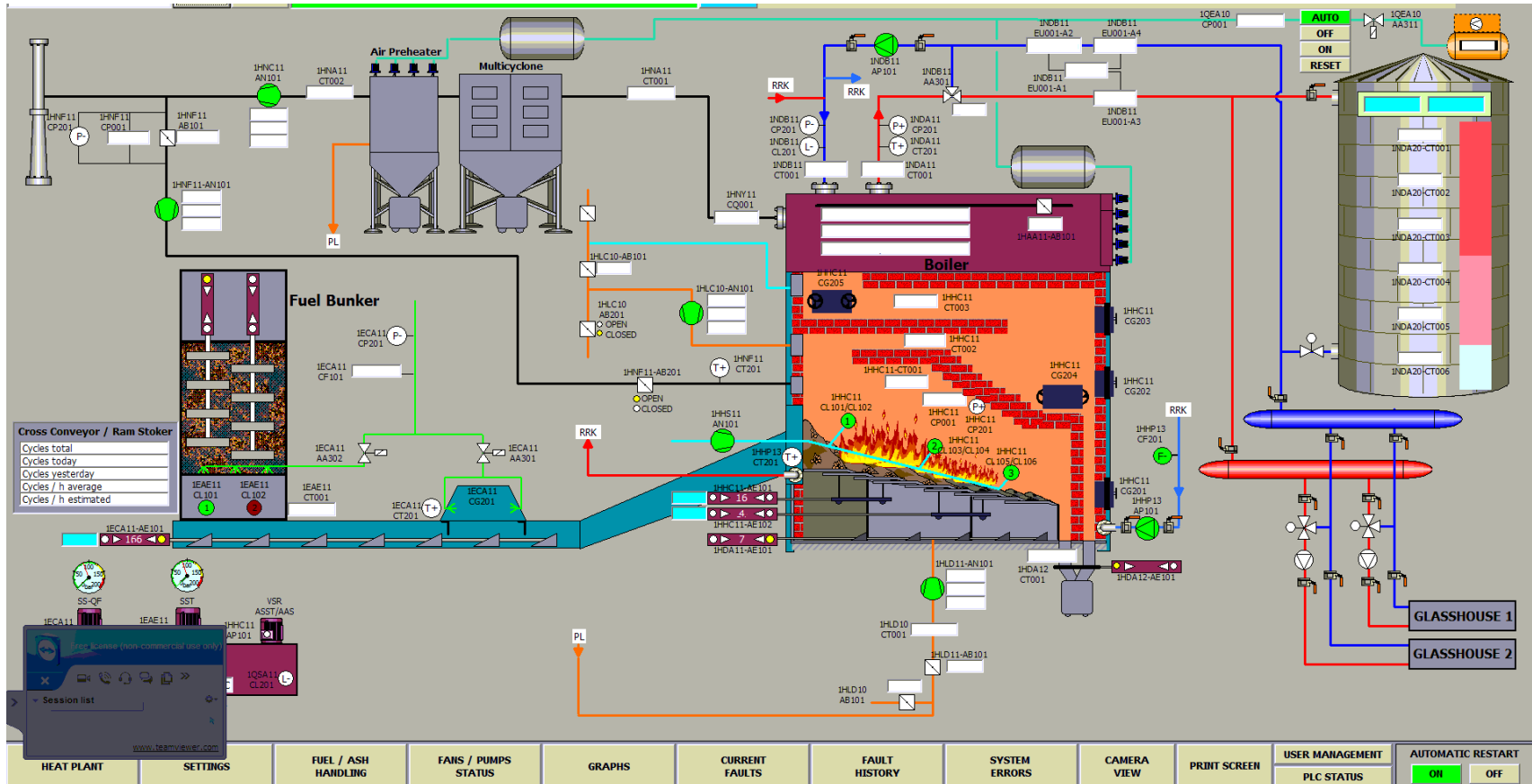
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Technology

- Fuel feeding
- Fire protection
- Reciprocating step grate
- Primary air / secondary air
- Flue gas recirculation
- Grate de-ashing
- Automatic cleaning
- Emissions control
- Air preheating
- Automation and control



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PRACTICAL HYDROPONICS & GREENHOUSES

The Commercial Growers' Magazine

www.hydroponics.com.au



ISSUE
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GIPPSLAND GROWERS GO GREEN

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Australian Examples

- Former brown coal briquette users
- 1.6 ha / 2 ha tomato / eggplant production
- 500,000 kg / 1,000,000 kg respectively
- High tech / automated operations





- New biomass system (1.6MW depicted here)
- Creates thermal energy from timber waste / forestry residue

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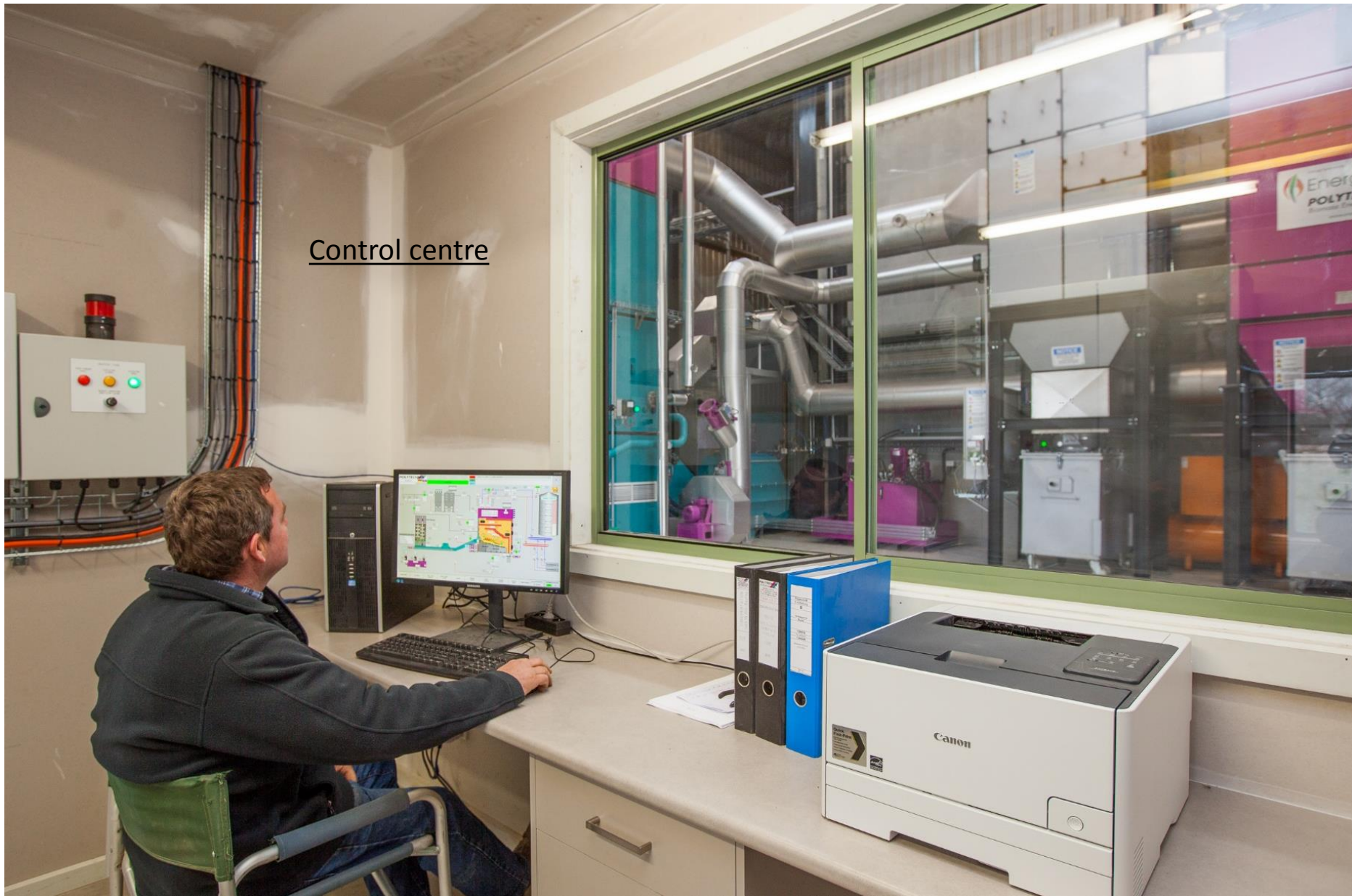
- Range of fuel capabilities; sawdust, strings of bark <600mm, various size chip P100, ram feeding
- Fuel pricing dropping below \$30/tonne delivered
- Up to 60% moisture content with air preheater
- Walking floor trucks deliver up to 80m3 per load
- Fuel comes from various timber processing industries
- Hydraulic cross conveyor, feeding via knife/counter knife to the step grate



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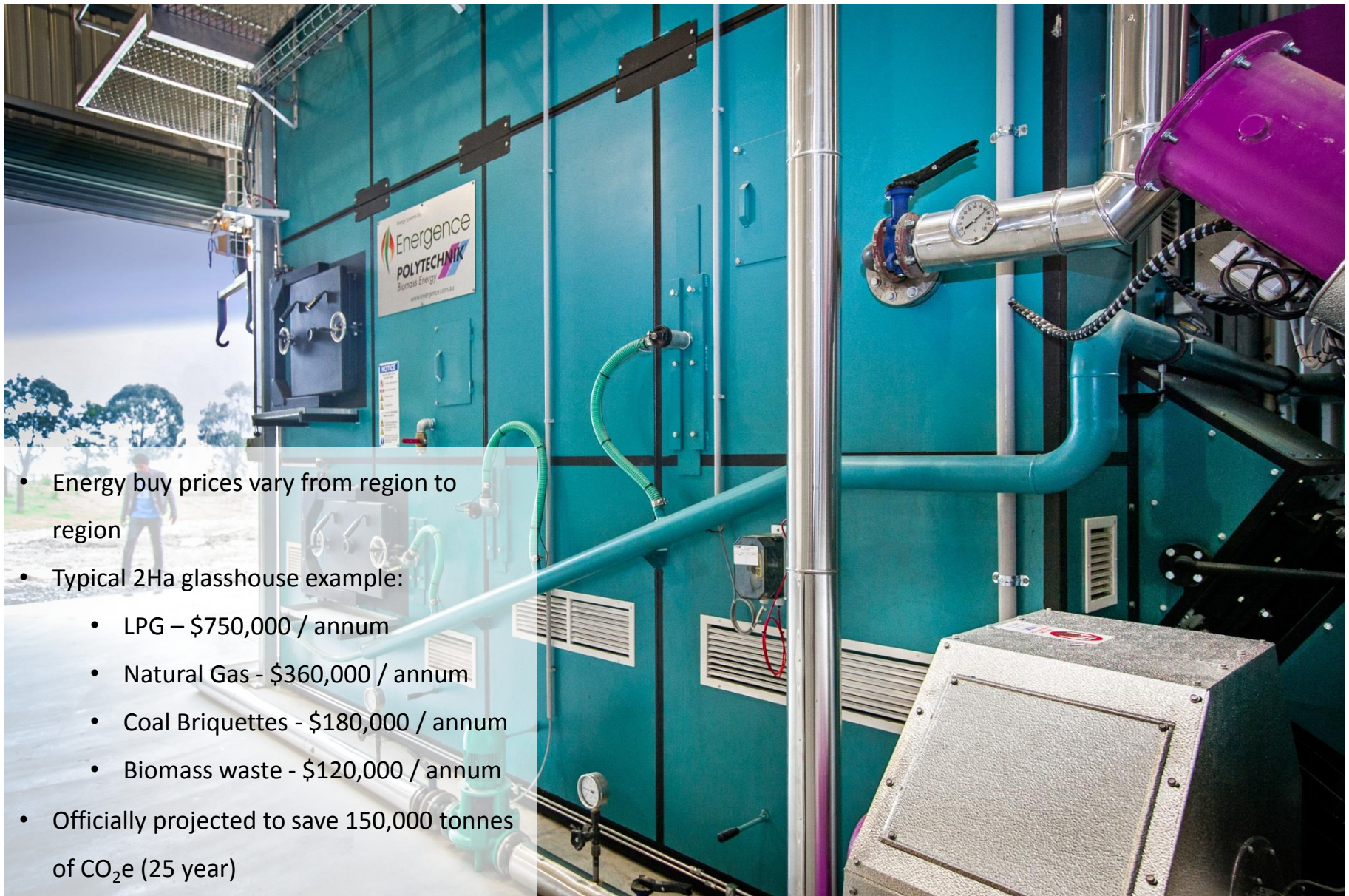
Control centre



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- Energy buy prices vary from region to region
- Typical 2Ha glasshouse example:
 - LPG – \$750,000 / annum
 - Natural Gas - \$360,000 / annum
 - Coal Briquettes - \$180,000 / annum
 - Biomass waste - \$120,000 / annum
- Officially projected to save 150,000 tonnes of CO₂e (25 year)

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Airbus site, Toulouse France

- 10,000 employees manufacture A320 to A380 inc A350 assembly line and paint shop
- 13.5 MW Polytechnik saturated steam boiler plant
- 22,000 tonnes annual biomass consumption
- 12,000 tonnes CO₂e reduction per annum
- Emission limit for particulates is 20 mg/m³ and during normal operation the plant achieves 2 to 8 mg/m³
- CO levels, which is the main indicator for complete and efficient combustion is practically zero and the plant efficiency is over 90%
- Ash used by local farmers as fertiliser
- Cost savings in comparison to gas on the order of 50%



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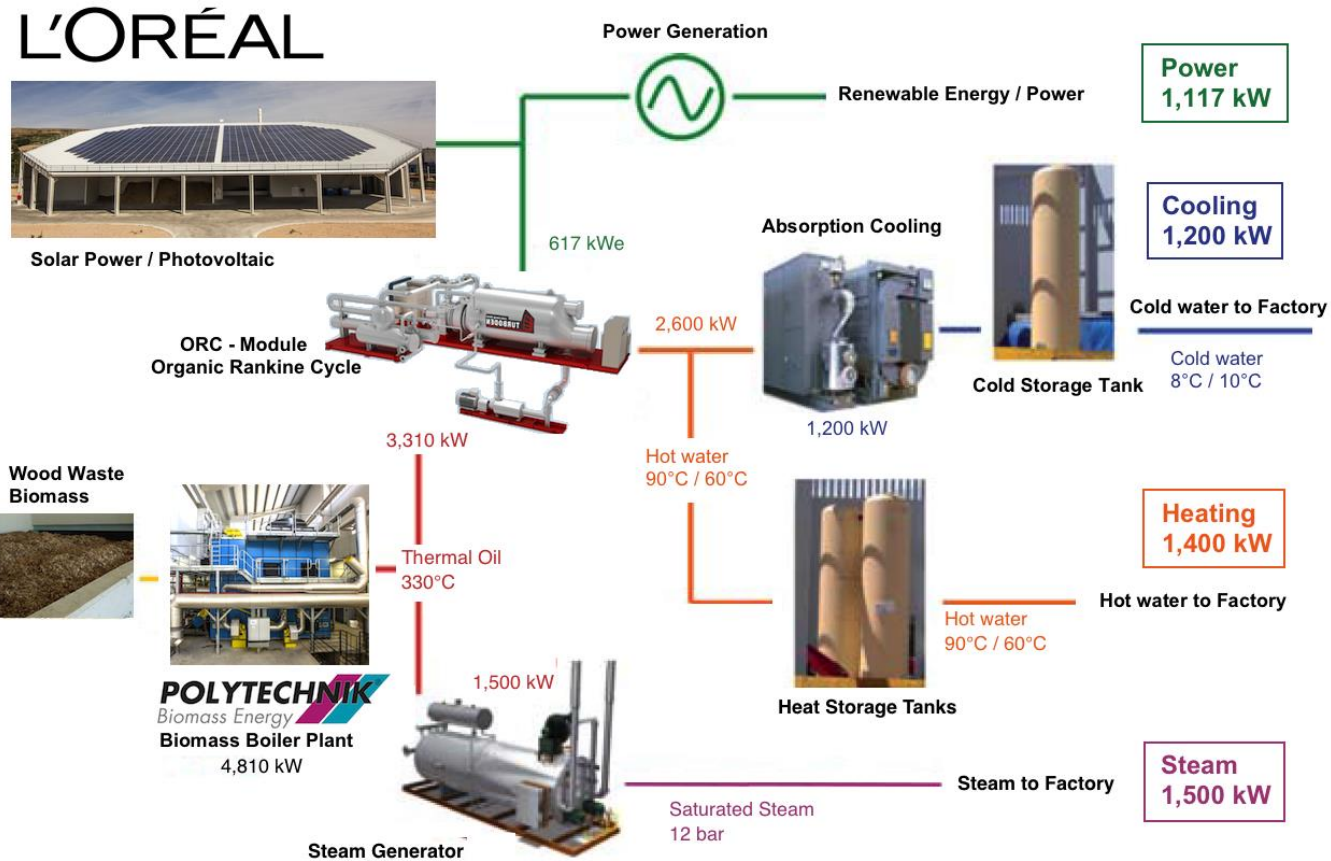


L'Oreal, Spain

- 25th September, 2014 opened a new biomass plant at their haircare product manufacturing facility
- Trigeneration plant supplies the factory with thermal energy, cooling capacity and electricity
- In conjunction with investment in photovoltaic panels, this project will make their site carbon neutral from 2015 into the future
- Biomass fuel in the form of forestry and sawmill residue is sourced in the nearby Castile and Leon region.



- 4.8 MW Polytechnik thermal oil boiler with moving grate
- 600kWe/2600kWth ORC Turboden 6 CHP
- 20,000 MWhrs thermal energy production per annum
- 12,000 tonnes annual biomass consumption
- Factory consumes 70% of this energy / 30% sold to neighbouring businesses



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Questions?

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