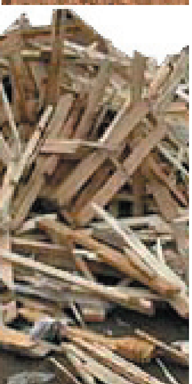
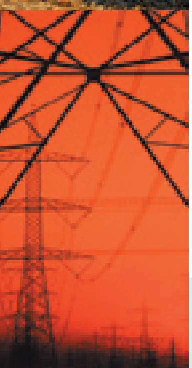
Cost considerations in using wood waste to produce renewable energy

National Association of Forest Industries

Wood Waste Bioenergy Information Sheet No. 9

Wood waste and other forms of biomass can be used to manufacture a range of renewable energy products (outlined in Information Sheet 11). However, with financial incentives available through the Mandatory Renewable Energy Target (MRET) or the Green Power Schemes, it is most likely that wood waste would be used to generate electricity, as opposed to other forms of renewable energy.

Investment in electricity generation from wood waste will depend on whether it can compete with other forms of renewable energy, such as solar, wind and hydro power sources. A number of reports have provided an estimate of the costs of supplying electricity from coal and renewable sources[1, 5]. The range of estimated production costs across the various sources of renewable electricity are provided in Table 1 (wood waste is a form of biomass in this comparison).

While dedicated biomass facilities could generate renewable energy at a lower cost than either solar or wind facilities, it is important to note that the most cost-effective renewable energy option is the co-firing of coal with biomass.

	Average cost of generation $/MWh
Coal	24-43
Co-firing/biomass	42-61
Co-firing/bagasse	45-70
Biomass	54-103
Solar	182-271
Wind	66-107

Table 1. Cost range for electricity generation from coal and renewable energy sources.

When estimating the costs and commercial viability of converting wood waste into renewable electricity, the key factors to consider for each specific project are:

- Volume of wood waste available
- Delivered costs of wood waste
- Infrastructure available to supply renewable energy markets
- Prices of renewable energy products
- Scale and efficiency of the operation
- Capital investment requirements
- Gaining approval to develop projects.

Key Points:

- *The cost-effective production and conversion technology employed to produce renewable energy from wood waste depends on the combined effects of a number of factors[1]:*
  - *Volume of wood waste available*
  - *Delivered costs of wood waste*
  - *Infrastructure available to supply renewable energy markets*
  - *Prices of renewable energy products*
  - *Scale and efficiency of the operation*
  - *Capital investment requirements*
  - *Gaining approval to develop projects.*
- *The cost of the delivered wood waste feedstock accounts for at least 50% of the total cost of producing renewable energy[2] and is determined by the costs of transport, basic density of the wood, its energy content, the moisture content and the volume of ash produced[3].*
- *To produce renewable electricity, wood waste may need to be delivered at a cost of $20 to $25 per green tonne[4].*

Plant efficiency and feedstock costs

A limited amount of infrastructure is needed in existing power stations to support the co-firing of coal and biomass. Beyond this most cost-competitive option, renewable energy suppliers using wood waste would have to undertake a major investment in new capital equipment.

The average capital cost for building renewable energy plants using wood waste varies, depending on the size of the plant, around $2m for each MW of capacity[1]. Large economies of scale in electricity generation means that as the size of a power plant increases, the average capital costs decline. After selecting a suitable scale of operation, the cost of wood waste resources will determine whether the facility is commercially viable.

Importantly, power plant should be sited to maximise the cost efficiencies associated with transporting the wood waste[6], given that the value of wood waste is a function of its basic density (amount of wood per tonne of green wood), the energy content (or calorific value), moisture content and the amount of ash produced when the wood waste is burnt[3]. For example, a low basic density and high moisture content means that a significant proportion of the transport costs will be spent moving the water contained in the wood waste.

Taking these factors into account, the capacity to pay for wood waste supplied to a 25-35 MW facility with a 25% energy conversion efficiency is around $20 to $25 per green tonne delivered to the facility[4]. Around these benchmark figures, the capacity to pay for wood waste will be lower for smaller and less efficient plants, higher for larger and more efficient plants. However, the lower average capital costs of larger plants needs to be balanced against the greater costs required to transport wood waste over longer distances to feed the larger facilities.

A significant cost for renewable energy projects can be obtaining all government development approvals and community acceptance[7]. This will require project proponents to work through a process of demonstrating the sustainability of their investment in renewable energy generation, including steps for monitoring and reporting on their performance at each stage of the development[8].

What is the appropriate scale of operations for a wood waste-fired power station?

Given the limited capacity to pay for wood waste and the relatively high costs of transporting these resources, the size of a wood-fired power station will be determined by the volume of wood waste that is available within an economic haulage distance of each facility. The capacity of most wood waste plants will therefore be restricted to the range of 20 – 40MW, making it extremely difficult for these facilities to compete directly with coal-fired power stations.

What volume of wood waste would be required to supply a wood-fired power station?

A 30MW wood waste power facility operating 22 hours a day and for 320 days per annum, would produce a total of 211,200 MWh of electricity in any one year. Assuming it takes 1.5 – 2.2 tonnes of green wood waste to produce each MWh of electricity, a 30MW plant would require between 320,000 and 465,000 green tonnes of wood waste on an annual basis[1, 6]. This would produce enough electricity for around 30,000 homes[1].

The effect of alternative product pricing

On a direct comparison basis, efficient wood waste fired power plants (operating at an estimated cost of up to $70-$80 per MWh) will not be competitive with power from coal (at an estimated cost of $24-$43 per MWh).

The creation and trading of Renewable Energy Certificates (RECs) for the additional renewable energy generated from wood waste, would help to bridge this gap (see Fact Sheet 8 for further information on the RECs). RECs have been trading for between $35 and $38 (with one REC created for each MWh of electricity that is generated in an accredited facility).

Co-firing of wood waste with coal has an estimated cost of production of $42-$61 per MWh. It is the most competitive form of renewable energy that can be derived from wood waste. Co-firing of wood waste and bagasse, at an estimated cost of production of $50-$75 per MWh, may be the next most viable option.

1. Report 4 – Converting wood waste into renewable energy – a summary of biomass energy conversion technologies.
2. Gerardi (2005) Prospects for bioenergy in Australia, Bioenergy Australia Conference (Melbourne).
3. Report 3 – Potential wood flows, technical and scale issues and identification of sustainable management criteria (p.20).
4. Report 3 – Potential wood flows, technical and scale issues and identification of sustainable management criteria (p.35).
5. ABARE eReport 03.12 (2003) Excluding technologies from the Mandatory Renewable Energy Target; Commonwealth of Australia (2000) Renewable Energy (Electricity) Bill explanatory memorandum; Coombes and Corderoy (2000) Biomass co-firing with coal, Bioenergy Conference Proceedings, Broadbeach, Queensland (4-6 December).
6. Rizza (2005) Babcock and Brown's bioenergy projects, Bioenergy Australia Conference (Melbourne).
7. Jones (2005) Western Australian bioenergy projects, Bioenergy Australia Conference (Melbourne).
8. Raison (2005) Demonstrating the sustainability of forest bioenergy projects, Bioenergy Australia Conference (Melbourne).

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