7

Using forestry biomass

7.1 As discussed in other chapters, there are considerable opportunities for some wood-waste products to be used to generate energy and to store carbon. The inquiry's terms of reference instruct the Committee to examine the 'potential energy production from the forestry sector, including:

- biofuels;
- biomass;
- biochar;
- cogeneration; and,
- carbon sequestration.'

7.2 These matters will be discussed in two sections: forestry bioenergy; and carbon sequestration.

Forestry bioenergy

7.3 Bioenergy production from the forestry industry involves biomass and biofuels. For the purposes of this discussion, Biomass refers to organic material – forest residues, trees and woody plants, grasses and agricultural residues – that can be used to produce energy. This can be done in two principal ways. First, biomass can be used as a direct fuel, for example for combustion. Second, biomass can also be used to produce a biofuel – a secondary fuel – such as biodiesel, methane or ethanol.

7.4 As noted by the Department of Agriculture, Fisheries and Forestry:

> Biofuels and bioenergy can play an important role in expanding the range of renewable energy sources available in Australia. Australian state and territory governments have adopted comprehensive frameworks to ensure that environmentally responsible forest management practices underpin the use of wood residues for bioenergy.[1]

7.5 There was considerable evidence to the Committee about the potential for 'waste products' from the forestry industry to be used as biomass or biofuel. There are a number of important aspects of forestry bioenergy that warrant discussion. They include environmental issues, the necessary supply chain to make forestry bioenergy economically viable, and the potential sources of biomass for forestry bioenergy.

Environmental performance

7.6 Because new biomass can be grown to replace used biomass, it is considered a renewable energy. As described by Bioenergy Australia:

> During the energy recovery process, the carbon dioxide bound in the biomass is released to the atmosphere. Bioenergy is regarded as renewable, when the biomass resource consumed in the energy conversion process is replenished by the growth of an equivalent amount of biomass. Under the Kyoto Protocol bioenergy is regarded as carbon dioxide neutral.[2]

Hence, whilst biomass emits carbon dioxide when converted to energy, that carbon will be removed from the atmosphere as a replacement crop of biomass is grown. The carbon is in a cycle. This does not, however, account for the other gasses emitted when biomass is converted into energy.

Cogeneration

7.7 Cogeneration is the use of technology so that the various 'by-products' of energy production are captured and utilised, rather than being wasted. In the case of mill operations, biomass (waste products from timber processing) are often used as to heat boilers, to produce steam for the mill. However, the steam can also be used to run a turbine, and hence produce electricity.[3] Mr Jim Bindon, of Big River Group, described how his mill in

1 Submission 59, DAFF, p.28.

2 Submission 43, Bioenergy Australia, p.2.

3 Submission 54, Ta Ann Tasmania, p.4.

Grafton had used cogeneration to capture extra energy from a forest-waste boiler system:

> [We burn] mill waste. We already have a boiler and we already process steam to run our plant. We added a steam engine in the middle, which is the ultimate value-adding of the resource—it was free—in between[4].

7.8 The Institute of Foresters of Australia submitted that cogeneration can be used to increase the efficiency of a mill, whilst also reducing the consumption of electricity from the grid:

> With most mills lucky to recover 40% of log volume, generating power using mill residue as a fuel source creates two economic solutions to what would otherwise be expenses. An expensive aspect of processing in the softwood industry is seasoning and drying, using kilns. The heat generated in cogeneration can be used to drive seasoning plants while augmenting power supplies.[5]

7.9 Mr Andrew Lang, of SMARTimbers Cooperative, noted that other possibilities exist for biomass to cogenerate electricity and heat. Technologies have been developed and utilised in many other countries:

> The pattern in the Scandinavian countries is to use the heat energy for district heating (and for district cooling in summer). In Brazil and India the heat energy is commonly used by the generating industry, as well as some of the electricity.[6]

7.10 According to the Victorian Association of Forest Industries, cogeneration can produce up to 90 percent efficiency in energy generation.[7] According to Mr Peter Rutherford:

> Production of heat and electrical energy from biomass has been operating on a commercial basis in many overseas countries for many years. There are limited examples in Australia, as the relatively mild climate does not present the range of opportunities for combined heat and power plants that are available in cooler northern hemisphere countries.[8]

7.11 Mr Jim Bindon noted the considerable financial investment required to install cogeneration technology, and suggested that such investment relied

4 Mr Jim Bindon, *Committee Hansard*, 1 September 2011, p.48.
5 Submission 84, The Institute of Foresters of Australia, p.18.
6 Submission 14, Mr Andrew Lang, p.6.
7 Submission 90, Victorian Association of Forest Industries, p.32.
8 Submission 11, Mr Peter Rutherford, p.3.

on native-forest biomass being treated as renewable energy.[9] This matter will be discussed further, in 'Sources of Biomass', below.

Biomass potential and supply chain barriers

7.12 The Future Farm Industries Cooperative Research Centre submission notes the considerable potential of bioenergy:

> The potential scale of this new industry is dramatic; dozens of biofuels/bioenergy plants are possible across the Australian agricultural zone as energy tree cropping is developed alongside existing farming activities. Such development will occur over many years, and each new renewable energy/fuel plant will be a major, sustainable, new business in a regional community. It is estimated that fabrication and installation of each commercial plant will provide at least 200 man years of work. Once operational, biomass supply, plant operation and maintenance for each biofuels facility will create approximately 100 permanent jobs (direct and in-direct), including skilled, unskilled and professional roles.[10]

7.13 However, as discussed in the Chapter 6, on Farm Forestry, expanding a new sector relies on a number of conditions. These include the quality and provision of infrastructure, access to markets, aggregation of numerous smaller producers, and ongoing resource supply and security. Whether bioenergy production is done at a local or regional level – as baseload power[11] or otherwise – these factors will affect its viability.

7.14 As noted by Bioenergy Australia, some individual bioenergy projects are hampered by market uncertainty and supply issues:

> The Committee should be aware that there are a number of bioenergy projects that have not as yet gone ahead for a variety of reasons, mainly due to the low and uncertain market for bioenergy and also difficulties and cost associated with fuel supply.[12]

7.15 Addressing these challenges is a central aim of Bioenergy Australia, a 'nation-wide government-industry alliance of some 83 organisations'. Two of its objectives deserve particular attention:

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9 Mr Jim Bindon, *Committee Hansard*, 1 September 2011, p.48.

10 Submission 68, Future Farm Industries Cooperative Research Centre, p.6.

11 Submission 68, Future Farm Industries Cooperative Research Centre, p.6; Submission 14, Mr Andrew Lang, p.6; Submission 81, Australian Forest Growers, p.22.

12 Submission 43, Bioenergy Australia, p.13.

> Broaden the market for biomass by enhancing opportunities, and by helping to reduce financial, regulatory, fuel supply, technical and institutional barriers to enable widespread adoption of biomass energy.
>
> Facilitate the development and deployment of biomass energy business opportunities and projects.[13]

7.16 Australian Forest Growers have suggested that funding be made available for:

> Research, development and extension into biofuel, bioenergy and Biochar technology, including upscaling the technology to a commercial scale. This upscaling must include options for regionally based utilisation of biomass at sufficient scale to be economically viable yet small enough to be effectively utilised locally.[14]

Sources of Biomass

7.17 Many submissions to the inquiry note that the viability of bioenergy is dependent on its treatment as renewable energy under the Renewable Energy Target (RET) scheme.[15] Under the scheme, the generation of renewable energy entitles the generator to a certain number of renewable energy certificates. These are then sold to 'liable entities' (usually electricity retailers) who are obliged to acquire and then surrender a certain number of certificates each year.

7.18 The application of the RET to energy created by using native forest wood has been in a state of flux over the course of the inquiry. As noted by the Department of Agriculture, Fisheries and Forestry in April 2011, native forest wood waste was eligible for support under the RET according to the following conditions:

- biomass must be harvested primarily for purposes other than energy production;
- the value of the primary wood products must be greater than the value of other products resulting from harvesting (known as the 'high-value' test); and

13 Submission 43, Bioenergy Australia, p.1.

14 Submission 81, Australian Forest Growers, p.23.

15 Submission 90, Victorian Association of Forest Industries, p.3; Submission 72, Forest Industries Association of Tasmania, p.4; Submission 119, Australian Forest Products Association, p.1.

- forestry operations must be carried out in accordance with the principles of ecologically sustainable management.[16]

7.19 However, under the proposed *Clean Energy Future* plan announced in July 2011, native forest wood waste would no longer be an eligible source of renewable energy:

> The Renewable Energy Target regulations will be amended to exclude biomass from native forest as an eligible renewable energy resource. This includes products, by-products and waste associated with or produced from clearing or harvesting of native forests, subject to appropriate transitional arrangements for existing accredited power stations.[17]

7.20 The legislation for the *Clean Energy Future* plan passed the House of Representatives on 12 October 2011, and will be considered by the Senate in late 2011.

7.21 Some evidence to the Committee criticised the change in policy, and called for native forest waste to continue to be eligible as renewable energy under the RET. The Australian Forest Products Association made a submission to the inquiry which stated:

> AFPA is deeply concerned about the implications of this decision as such a policy reversal is not only inconsistent with the international science of the carbon neutrality of biomass - it places local wood based businesses at a competitive disadvantage compared with other renewable energy sources in Australia and with many overseas suppliers who have favourable bioenergy incentives. This is particularly the case in Europe where wood biomass represents a high proportion of total renewable energy. The RECs provide an additional market incentive for the use of wood biomass for renewable energy in Australia. The implications of such a policy would disadvantage native forest growers and managers (both private and public), any processors wishing to utilise native forest wood residues for bioenergy and other renewable energy facilities and producers which rely on such a feedstock.[18]

7.22 Similar views were expressed by some witnesses, including Professor Jerry Vanclay:

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16 Submission 59, DAFF, p.28.

17 Securing a Clean Energy Future / The Australian Government's Climate Change Plan, July 2011.

18 Submission 119, Australian Forest Products Association, pp.1-2.

> I am a little distressed at some of the current signals from government about not allowing the use of wood residues from forests and sawmills. I think that all of those wood residues should be used for bioenergy of one form or another and should be eligible as a renewable energy material. It is really important to get a sensible pathway to greenhouse reduction.[19]

7.23 Some submissions strongly opposed native forest waste being used to generate energy: 'Under no circumstances [should] such native forests be considered for energy production.'[20] According the MyEnvironment Inc, because of the 'lack of governance and sustainability in native forestry it is clear that any use of Native Forests for use in the production of energy would be immoral.'[21]

Committee Comment

7.24 The Committee believes that bioenergy from the forestry industry is a promising opportunity for the industry. As well as providing help to deal with climate change, and reducing Australia's reliance on fossil fuels, it provides another way for the forestry industry to diversify and contribute to economic growth in local areas.

7.25 Using the principle of cogeneration, it is also possible to ensure that as much energy as possible is captured and used from the use of biomass. This relies on technological innovation, and the Committee was pleased to visit mills during the Inquiry that have invested in this promising approach to energy.

7.26 As noted above, there remains a significant amount of work to be done by the industry, in order to identify the barriers to expansion of bioenergy, and to ensure that a secure fuel supply is maintained. Whilst the Government should be supportive of these efforts, the Committee believes that it is up to the industry to develop its own plan for the future of bioenergy, to ensure that it can expand and deliver benefits for the forestry industry and the broader community.

7.27 As for the question of native forest waste products being used to produce energy, the Committee is aware that recent policy change is yet to be fully implemented. As noted in Chapter 4, the Committee believes that the future of native forestry in Australia lies in high-value appearance grade

19 Professor Jerry Vanclay, *Committee Hansard*, 1 September 2011, p.2; see also, Dr Douglas Head, *Committee Hansard*, 1 September 2011, p.29;

20 Submission 73, Dr Prue Acton OBE, p.7.

21 Submission 73, MyEnvironment Inc, p.4.

and structural products. By ensuring that high value products are made, the use of native forest waste for energy production will be more viable.

7.28 The Committee is of the view that under any version of the RET (or similar scheme), bioenergy sourced from native forest biomass should continue to qualify as renewable energy where the biomass is a true waste product and does not become a driver for harvesting native forests. A workable definition of 'waste product' must also be clearly agreed and enacted, on which a Ministerial discretion can then rely.

7.29 If individual native forest bioenergy production satisfies those two criteria, the appropriate legislation or regulation should direct the Minister to grant an exemption from the native forest biomass exclusion.

7.30 The production of energy from native forest biomass should be subject to reporting requirements, to ensure that only true waste products are used. This should consist of reporting to the Minister's Department of biomass volumes used, energy produced and income generated. This will ensure that the use of native forest biomass is widely supported in the community, and will help build the social licence of forestry generally.

Recommendation 15

7.31 **The Committee recommends that, under any version of the RET (or similar scheme), bioenergy sourced from native forest biomass should continue to qualify as renewable energy, where it is a true waste product and it does not become a driver for the harvesting of native forests.**

Recommendation 16

7.32 **The Committee recommends that, if the above principles are adhered to, legislation or regulation direct the Minister to grant an individual exemption from native forest biomass exclusion.**

Recommendation 17

7.33 **The Committee recommends that, under any system of exemption from the native forest biomass exclusion, provision be made for reporting on biomass volumes used, energy used and income generated, to ensure that the biomass used is a true waste product.**

Carbon Sequestration

7.34 As noted throughout the inquiry, trees present an enormous opportunity to sequester carbon from the atmosphere. Across the forestry industry, there are ongoing efforts by individuals and groups to increase our understanding of how to best prolong the storage of carbon in trees and harvested wood. As noted in Chapter 3, understanding the entire carbon cycle through trees, timber and wood-products is a complex yet necessary task.

7.35 There is also a need for greater clarity about the carbon storage profile of old and young forests. The Committee is aware that young forests – growing quickly – sequester carbon more quickly than old forests. However, established forests contain carbon that has been progressively sequestered over a long period of time. Understanding the carbon stored and added to forests over time is important for making good decisions about forestry and climate change.

Biochar

7.36 Biochar is produced where biomass is subjected to pyrolysis, also resulting in the production of a secondary fuel gas. The biochar stores carbon, and can be used to improve agricultural soil:

> Biochar is produced by burning biofuel in a retort with restricted oxygen supply. Approximately half of the biofuel is converted into a gas which can be used to power generating equipment with the remainder forming a charcoal-like material known as biochar. In agricultural applications this can be incorporated into the soil when sowing seed, and this enables the carbon in the biochar to be

> locked up in the soil for many decades, potentially up to 100 years.[22]

7.37 The Former House of Representatives Standing Committee on Primary Industries and Resources reported on Biochar in its 2010 report titled *Farming the Future: The role of government in assisting Australian farmers to adapt to the impacts of climate change.* That report included discussion of the benefits of biochar for agriculture.[23]

Integration of biochar with forestry and agriculture

7.38 The submission from the CSIRO detailed current research into biochar, from the points of view of both forestry and agriculture:

> CSIRO is currently undertaking research into the potential application of biochar to agricultural soils. This research is addressing both the role of biochar in soil carbon sequestration and as an amendment to improve soil health. An important aspect of the work is assessing differences in the physical and chemical properties of biochar produced from different feedstock sources, including various types of wood based biomass, and how they behave in soil...Understanding the characteristics of biochar is key in matching biochar products to their end-use. There is currently no information available as to the effects of biochar applied to forest soils. This is an important area that needs to be investigated as it would be of interest to avoid large transport distances for biochar made from plantation harvest residues and instead apply it close to its source and production.[24]

7.39 That submission also outlined areas of priority for further research, including:

- Identification of the most cost-effective methods of harvesting and transporting of various biomass feedstocks;
- The potential impact of biorefineries producing high-value petrochemical compounds in addition to energy;
- Further research on the physical and chemical properties of different biomass types, which determine feedstock quality; and

22 Submission 84, The Institute of Foresters of Australia, p.18.

23 House of Representatives Standing Committee on Primary Industries and Resources, *Farming the Future: The Role of Government in Assisting Australian Farmers to Adapt to the Impacts of Climate Change*,p p.50-52.

24 Submission 39, CSIRO, p.13.

- Characterisation of chemical, physical and biological properties of biochar products from different types of forestry residues that relate to their potential end uses.[25]

7.40 There are numerous current research and development projects around Australia, looking into the best way to integrate the production and use of biochar into both forestry and agriculture. For example:

> Research at Curtin University has moved close to optimising the production of fuels from mallee biomass combined with a biochar as a potential additive to soils.[26]
>
> Australian companies such as Pacific Pyrolysis, Crucible Carbon, AnthroTerra are now developing pyrolysis technologies for the co-production of biochar and energy applications (mainly power).[27]
>
> Greening Australia, with support from a major corporate foundation, is investigating the second generation biofuel potential of locally native eucalypts and acacias in western Victoria. We are also investigating the value of biochar that is commonly a secondary product of pyrolysis that generates biogas (or syngas).[28]

and

> The Renewable Oil Corporation (ROC) is an Australian company that can convert woody biomass into liquid fuels and biochar using fast pyrolysis. ROC proposes to build the first biofuel plant in the South-West of Western Australia, which could lead to multiple plants that use farm grown woody biomass thereby boosting regional investment and employment.[29]

Committee Comment

7.41 Biochar is an exciting new use for forest by-products, and looks to be of great benefit both to forestry and agriculture. A considerable amount of research is currently being conducted into biochar production and use, and the Committee looks forward to seeing a much bigger role for it in future.

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25 Submission 39, CSIRO, p.13.
26 Submission 106, Oil Mallee Association, p.3.
27 Submission 43, Bioenergy Australia, p.12.
28 Submission 31, Greening Australia, p.6.
29 Submission 68, Future Farm Industries Cooperative Research Centre, p.27.