Frequently asked questions about wood energy

1. If I convert from coal to solid biofuel will there be enough biofuel?

Yes, provided we think ahead and don't just assume that someone somewhere will produce more biomass. Theoretically we can always grow enough herbaceous or woody biomass which can be processed to be a biofuel. The solid biofuel supply market has to be a managed market as the planting of additional trees etc require an action by foresters or landowners.

Users of solid biofuel are encouraged to establish long term partnerships with their biofuel suppliers so that the supplier has the confidence of future demand in order to establish long term arrangements with forestry of agriculture parties for sourcing biomass.

Some heat plant owners are themselves planting areas of woodlot so that they know that they have a strategic reserve for future biomass. Plus, it strengthens their negotiating position when negotiating biofuel supply contracts.

The heat plant owners in an area are encouraged to work together to give indications of future biofuel demands so that landowners and wood residue aggregators can forward plan with confidence how they can meet possible future contracts.

2. How do I get wood fuelled boilers to load follow in a milk drier application?

Gas and diesel fired boilers typically respond faster than biomass boilers to load changes which is an advantage. However, with advanced control systems which are now available on the market a wood fuelled heat plant can follow almost all load changes a dairy plant requires. Furthermore, it's not unusual to have biomass and gas/diesel fuelled boilers on one site as back-up and for low and peak loads. On low temperature applications a hot water buffer tank can provide the additional energy to meet peak demands.

3. Why is wood fuel better than coal for meeting air emission consent conditions?

If utilised in controlled energy plants wood has got significantly less emissions than a coal boiler plant. Countries worried about the impact of pollution on the health of their citizens usually have emission limits for the main health hazards coming from combustion processes:

- Organic C (HC, VOC, etc.)
- Particulates (PM 2.5 and PM 10)
- NOx
- SOx
- Heavy metals (e.g. Hg)
- CO (=incomplete combustion)
- other harmful substances like HCl, PCDD/PCDF etc.

Emission control systems on coal fuelled plants make them uneconomic compared to what can be achieved with properly controlled wood fuelled plant. Also the sophistication of the control systems can affect the level of emission clean up required before discharge to air e.g. a wood energy plant with low NOx and particulate emissions control will have to install a bag house (or ESP) and a SNCR (selective non catalytic reduction system).

For a coal plant to achieve the same emissions it would need to install a bag house, a scrubbing system with additives (lime product or sodium bicarbonate as well as activated carbon for Hg reduction) and a SCR system (selective catalytic system) which is significantly more expensive than a SNCR system.

To make coal boiler plants as clean as wood boiler plants you'd need to spend more money for the emission control system than for the boiler plant.

4. Can we not use forest harvest residues as fuel?

New Zealand harvests about 26 to 28 million cubic metres of timber and that over 50% of that gets shipped overseas in form of logs and pulp (wood chips) which in addition to the residues which we're leaving in the forests and other dumping sites would be many times more fuel that what we'd need for all industrial and domestic heat in New Zealand and provide feedstock for the production of transport biofuels.

In New Zealand millions of tonnes of wood residues are not utilised and thus wasted. Some of the larger harvest skid areas are causing quite big water pollution issues as the run-offs from these dumping sites are very harmful to both flora and fauna. Furthermore, the greenhouse gas emissions from decomposing wood are higher than if we'd utilise the wood in energy plants as wood releases not only CO_2 when rotting it also releases methane which is a >25 times stronger greenhouse gas than CO_2.

In countries with strict environmental rules and laws, especially when it comes to the water quality, like Germany and Austria the dumping of wood harvest residues is not allowed hence it needs to be utilised anyway.

Forest harvest residues are a source of producing a solid biofuel. The residues often need to be processed by chipping or shredding (hogging) to make them into the size necessary for use as a boiler fuel. Forest residue also generally needs to be dried to the appropriate moisture content suitable for combustion in a boiler.

Forest harvest residues have higher collection and processing costs than residues derived from sawmills and other wood processing plant but if appropriately collected and graded the harvest residues can meet the appropriate wood fuel classification grades. Find more information on collection techniques.

5. Can I convert an existing coal fuelled boiler to wood fuel?

Yes, but not cost effectively to all coal plant. Wood and coal have very different burning characteristics with coal having a higher calorific value. This means that it burns hotter and also the stages of combustion are different so where and how it burns in the fire box will result in lower heat performance for wood fuel unless significant modifications are made.

For some coal plant the conversion can be a low capital cost economic solution to improving discharge of emissions to air and being able to operate within air emission consent conditions. However, plant heat production performance will probably reduce. Conversion from coal to wood can appear attractive when access to capital is constrained. However, for many plants a satisfactory conversion is unlikely to be either economically viable or technically satisfactory.

For some coal boilers the modifications required can be small but for most there will need to be significant fuel handling changes as the bulk density of wood is much less than for coal so a lot more wood fuel is required to get the same amount of heat. The storage facilities will have to be made much bigger for wood fuel and the augers transferring wood fuel from the storage to the burning may need to be altered.

High quality chip or pellets are often used as the grade of wood fuel as they may have good flowability through the existing augers etc.

Dust suppression and explosion control modifications may need to be made to existing coal equipment as solid biomass can produce more dust than coal.

If the conversion is not designed properly then no amount of "tinkering" will be likely to fix it. The "suck it and see" approach to fuel conversion is a recipe not only for failure, but gives the concept of conversion a bad reputation: *Bioenergy Association advises that if it can be afforded then the "do it right the first time" approach to fuel conversion by replacing old coal plant with new more efficient wood fueled plant will be a better lifecycle cost investment.* For further information:

1. View the presentations given at the Commercial biomass boilers and co-firing workshop.
2. Information sheet 5: Education facilities using wood fuel
3. Information sheet 9: Co-firing coal with wood
4. Technical Guide 02: Guidelines for the conversion of solid fuel underfed boilers from coal to wood pellet

It is recommended that trials be undertaken using different types of solid biofuels in te existing coal boiler prior to design starting as the design of stoker infeed, amount of refractory, and type of boiler grate may require specific modification to be done depending on the trial results.

6. Do fuel bunkers require ventilation?

Yes

Dust, causing explosivity risks: Dust from chip or wood pellets can occur through production, storage and delivery so should always be assumed to be present. Staff should wear dust masks. However the dust will only be an explosive hazard if the dust is very fine and very dry, such as with a sander dust or the dust that comes hand-in-hand with shavings or wood pellets (or flour, as another example). Dust-proof motors (IE rated) should be used and naked flames / ignition sources should be eliminated.

Care should be taken when opening bunker doors as the change in pressure can blow dust over staff if the door is not opened slowly.

Carbon Monoxide: Carbon monoxide is an issue mainly in pellet stores. This also necessitates the categorisation of pellet stores (depending on the design) as a 'confined space' and the need for appropriate training, permits and precautions.

Ventilation: Ventilation is generally good for avoiding or mitigating the risk to staff and from explosion, but also to assist moisture to exit the fuel store – so always a good idea.

To conclude, wherever there is dust, it is wise to have ventilation and explosion hatches, and run the appropriate safety regimes. Ventilation also assists the dissipation of moisture.

For a collection of dust and other safety best practice guides www.usewoodfuel.org.nz/safety

7. Does the combustion of wood produce a low level of emissions?

The combustion of wood produces carbon dioxide, water and heat. When wood burns, oxygen and sugar molecules disappear, and they are replaced by carbon dioxide and water molecules. Leaving only ashes that consist of wood's minor components that remain solid and do not burn. Although the chemical composition of wood varies from species to species, wood is primarily composed of carbon, hydrogen, oxygen, calcium, potassium, sulphur, nitrogen and magnesium.

An advantage of using wood fuel is that its combustion produces a low level of emissions. The emissions from combustion of wood fuel are significantly lower than for coal. The level of emissions will depend on the grade of the wood fuel used and the degree of combustion. The degree of combustion depends on the amount of oxygen provided to the combustor. Any fuel that is not fully combusted will produce particulate emissions. Incomplete combustion can arise from the poor design or tuning of the equipment, or from the quality of the fuel, particularly with regards to moisture content. The production of smoke is an indication of incomplete combustion.

The carbon dioxide produced by combustion of wood is not considered as a greenhouse gas if the wood is soured from waste or harvest residues. (www.usewoodfuel.org.nz/resource/tnbb18-bioenergy-is-carbon-neutral)

Solid biofuels supplied across New Zealand are sustainable and near carbon neutral because they are produced from either agriculture or plantation harvest residues, or processing residues. These residues would otherwise go to waste or to landfill.

Residential

In residential heating the use of solid wood (firewood) in open fires or older enclosed "wood burners" can often produce smoke if high moisture content wood fuel is used and there is incomplete combustion. The incomplete combustion also indicates that the efficiency of heating will be poor.

An advantage of using wood pellets for residential heating is that wood pellets are produced to a standard and that requires that the moisture content be consistently below a specified level. Because of the consistent low moisture content the combustion of wood pellets is also consistently highly efficient producing low levels of ash and minimal particulates. Because wood pellets are consistently uniform in their characteristics wood pellet heaters are considered a controlled heat source and thus often a permitted use and monitoring of emissions is not required by local councils.

Commercial / Industrial scale

Commercial and industrial scale combustion equipment is often designed to be able to use higher moisture content fuel and still have efficient conversion to heat and low emissions. However, that requires specific design.

Industrial scale heating equipment that uses wood fuel that may be variable in moisture content and other characteristics will invariably require monitoring of emissions to ensure that they are within resource consent conditions. An advantage of using wood pellets consistently produced to a standard is that the combustion in the heating equipment will also be consistent and so monitoring of emissions may not be required.

For more information see The use of forest biomass for climate change mitigation: Dispelling some misconceptions.