



Energy from Wood Basics

Harnessing a sustainable and under-utilised resource

Key Points

- Burning wood does not contribute to man-made carbon emissions if felled trees are replaced
- Wood fuel is a renewable heating resource if derived from sustainable and well-managed forests
- Modern wood-burning systems are very efficient and create minimal air pollution
- Developing the wood fuel supply chain could help the rural economy

Why is it important?

Burning wood does not contribute to climate change, as long as the wood is from a sustainable source (i.e. one tree is planted for each tree felled). Carbon dioxide (CO₂) is still released when wood is burned, but this is approximately equivalent to the CO₂ which is taken in by the trees over their lifetime (see Carbon Cycle diagram opposite).

Using wood as a fuel can also help the rural economy. Wood fuel can be provided from local sources in rural areas, creating new business and employment opportunities.

The main sources of wood fuel are listed below:

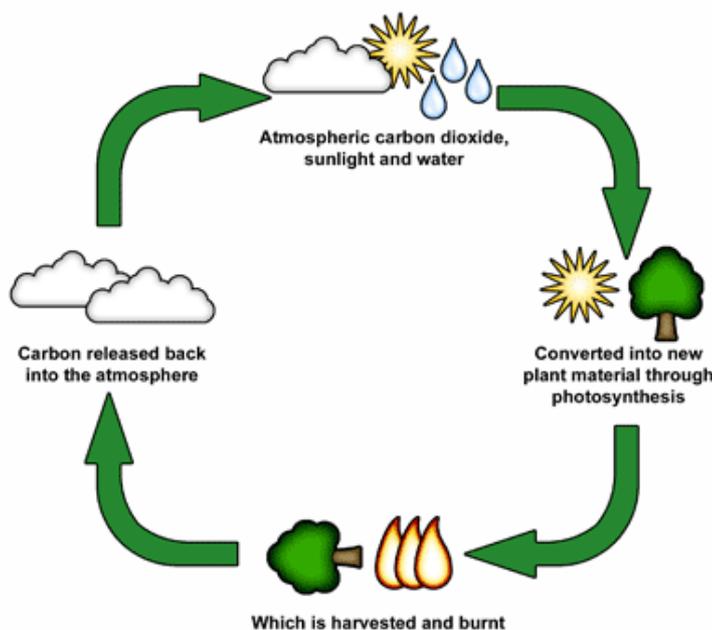
- Sawdust and debris from wood processing
- Residues from forestry or forest management
- Energy crops such as coppiced willow

Utilising wood

Logs or processed wood fuels can be burned directly to provide heat in a central heating boiler or a smaller room heating stove. At much larger scales, wood can also be burned to raise steam for power generation or CHP.



Modern bulk wood fuels: pellets (left) and chips (right)



The carbon cycle

Modern wood-burning appliances are just as efficient as the best gas boilers (capturing 90% of the energy as usable heat) thanks to advanced two-stage combustion and high performance heat exchangers. Compare this to the 10-20% efficiency of an open wood fire!

Wood pellets and wood chips are small and have a uniform size and shape, so they are suitable for automatic feed systems such as hoppers or screw augers, which are much more convenient than manual feeding.

Refined wood fuels, such as pellets or wood briquettes made from compressed sawdust, are now widely available. Using these dense fuels allow more units of energy to be moved in each lorry-load, reducing the cost and environmental impact of transport.

In countries such as Austria, wood fuel dominates the domestic heating market. Many of the market-leading appliances also originate there.

Wood stoves and boilers

Direct room heaters can be sized to heat a single room, a small home or the core of an open plan house. They can also be used with a back boiler to provide hot water and to heat radiators elsewhere in the building.

Room heaters designed specifically to burn wood pellets tend to be highly efficient and clean-burning, as well as convenient to operate. Stylish, modern designs provide an attractive centerpiece feature within a reception room.

Wood-fuelled central heating systems are also available,

running on wood chips (for larger sites), pellets or logs. Heating an average 3-bed family home would need about 8-10 dry tonnes of wood per year (around 3 tractor loads), or 4 tonnes of pellets, which have a higher energy density. Buildings with large year-round heat loads, such as schools and rural estates, are well-suited to wood heating.

Centralised wood energy

In countries such as Sweden and Austria, large central wood boilers are used to heat entire towns via underground heat mains—this is commonly known as district heating.

Wood-fired power stations generate electricity, and are comparable in size to a large barn or small factory. They exist in sizes from a few megawatts to hundreds of megawatts, and can serve as reliable 'baseload' generation. However, the efficiency of electricity-only plants rarely exceeds 30%, so CHP units, where the waste heat is utilized (e.g. by a nearby industrial process plant), represent a better use of the resource.

Site selection

Wood boilers are rather larger than conventional gas or oil boilers of equivalent output, and additional space is also needed for the fuel storage. The larger the store, the fewer deliveries are required: large loads also achieve lower prices. Provision for a stainless steel vertical flue is also required for the building housing the equipment.

A cheap, reliable fuel supply is the most important factor for a successful wood energy project. This is likely to be a local supplier, or even your own wood supply if available.

Using a local fuel supply keeps transport distances short. It is generally accepted through best practice that wood chips can be transported from within a 40 km radius before the energy impact of transport becomes a major issue.

Economics

Prices for wood fuel vary considerably, with local wood and by-products such as wood off-cuts being the cheapest fuel (perhaps even free). As a domestic heating fuel, wood pellets delivered bagged remain marginally more expensive than oil (per unit of energy content), but the cost will decrease as pellet production increases and local pro-



Below-ground wood chip store with easy delivery access

duction is established. For larger sites, bulk wood chip is the cheapest of all heating fuels, beating mains gas.

At any scale, wood heating systems tend to cost more to buy, install and maintain than fossil fuel systems, but the up-front investment will ultimately be repaid in lower fuel costs over the system's lifetime.

The financial benefits of wood fuel will be further enhanced in 2011, when the Government's *Renewable Heat Incentive* should arrive. This is expected to offer payments for each unit of renewable heat generated.

Environmental effects

Burning wood inefficiently causes smoke and air pollution; careful operation of wood burning systems almost eliminates this. Modern automated wood appliances are very clean, with the best systems being permitted even within Smoke Control Areas.

Wood-fuel production needs careful management to avoid damaging wildlife habitats, but well-managed wood fuel production can benefit nature conservation.

Further Information

Microgeneration Certification Scheme

Find approved products and installers
www.microgenerationcertification.org

The Log Pile—promoting wood fuel

www.nef.org.uk/logpile

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Domestic pellet stove (above) and large pellet boiler (right) - courtesy of RHPL Ltd

