Wood Fuel in Norfolk

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Foreword

It is not widely appreciated that wood is an environmentally and economically attractive option to fuel a number of modern heating systems in public buildings. Wood chip can be a cheaper fuel than most fossil-based resources and it contributes up to 97% lower CO_2. Since heating consumes most of the energy used in buildings in the UK, introduction of a low carbon fuel for heating could significantly reduce our County's carbon emissions.

In addition, these systems offer significant opportunities for economic and environmental regeneration in rural areas as well as sustainable development. They can use forestry products which results in well managed woodlands, energy crops that offer diversification potential for local farmers or waste-wood which would otherwise be land-filled.

In recognition of the environmental benefits that wood-based heating offers for sustainable development of the local economy, Shaping the Future and Norfolk County Council commissioned Easton College in September 2005 with a proposal to prepare practical advice on the implementation of small-scale wood-based heating systems. Justin Segrave-Daly, a local environmental consultant, contacted businesses and individuals within the biomass industry and put together this booklet. We hope it will prove a useful tool for anyone who is interested in practical means to achieve a more sustainable way of life.

Sir Nicholas Bacon

Chairman, Shaping the Future Rural Economy Board

Who is this booklet for?

This booklet has been produced to show the potential for generating heat from wood fuelled systems in the 21st century. If you are involved in farming, the waste industry, planning of new buildings, can influence the decision making process, or operating existing fossil fuelled heating systems, this booklet offers a starting point. The information in this booklet offers a chance for you to consider heat from wood fuelled systems through the provision of up to date information on the options available for wood fuel supply, the technologies available, issues to consider and case studies of successful systems.

CONTENTS

What do we mean by biomass?

Biomass: organic matter used as a fuel, especially in the generation of heat or electricity.

All Earth living matter is an abundant source of energy. From the beginning of human history, the predominant sources for heat and power were wood for heat and cooking, charcoal, wind and water for the power industry.

Wood, charcoal and farmed crops are forms of biomass. In an energy context it can be defined as “all non-fossil organic materials that have intrinsic chemical energy content”.

This energy content is known as bioenergy. Bioenergy can be produced from different biomass resources (or feedstocks) through various processes making it one of the most versatile energy sources. In addition, biomass is CO_2 neutral in terms of emissions when burned as a fuel. This is due to the fact that CO_2 is taken from the atmosphere and used by plants to grow.

Chapter 1 - Introduction

1.1 Why wood fuel?

- it is one of the most cost-effective ways of cutting heating bills, carbon emissions and meeting renewable energy targets.
- it uses a mature high efficiency technology.
- it is available from domestic up to multi-MW scale.
- local and regional fuel supplies for a local need – multiple sources including self-supply.
- it provides protection from global energy price hikes and political crises.
- it gives a superb environmental footprint, including a carbon neutral fuel.

1.2 Benefits of wood-fuelled heating

1.2.1 Reduces:

- CO_2 emissions by >90% compared with fossil-fuelled systems, supporting the move to a low carbon economy
- emission of pollutants e.g. sulphur (the sulphur content of wood is negligible)
- biodegradable waste going to landfill through using clean waste wood

1.2.2 Promotes biodiversity through:

- cultivation of low input crops that provide alternative habitats
- sustainable woodland and countryside management

1.2.3 Provides economic advantages because:

- wood fuel is usually cheaper than fossil fuels
- there is a low cost option for reducing greenhouse gas emissions
- landfill charges can be avoided
- new jobs contribute to economically sustainable rural communities

1.3 Modern wood heating boilers and stoves have the following characteristics:

- High efficiency – at levels from 87- 93%
- Low pollution levels due to high temperatures and complete combustion
- Rapid and automatic ignition
- Controllability through timers and energy management systems
- Capacity control which allows the output of the boiler to be varied without losing efficiency
- Low ash generation – 0.5 -1% or lower is common
- Can utilise a wide variety of biomass fuels

1.4 Woodfuel and carbon dioxide emissions

Wood-fuelled boilers offer a technically simple and cost-effective means to heat public buildings whilst realising large savings in carbon emissions. The CO_2 that is released when wood fuel is burnt is equivalent to that taken from the atmosphere through photosynthesis during plant growth. Even allowing for CO_2 generated during planting, harvest, processing and transport of the wood, replacement of fossil fuel with wood fuel will typically reduce net CO_2 emissions by over 95%, provided that the wood supply is managed sustainably.

1.5 The global picture

Our reliance on fossil fuels for energy has left our planet facing a potentially serious environmental problem. An increased concentration of CO_2 and other greenhouse gases in the atmosphere is contributing to global warming. To help address this issue, under the Kyoto Protocol, the UK is committed to reduce CO_2 emissions from 1990 rates by 12.5% during the five year period 2008 - 2012. UK Government has, in addition, set higher voluntary targets of a 20% reduction by year 2010, with the longer term aim of a 60% reduction by 2050.

1.6 Wood-fuelled heating can reduce CO_2 emissions

Over 80% of the fuel delivered to public buildings will be used for heating. Since 99% of the fuel that is delivered from non-renewable sources, heating of public buildings represents a significant opportunity for achieving reductions in greenhouse gases. Wood chip fired heating could be widely used for public buildings with heating requirements of 60kW - 80kW and above. It is a cost-effective means to reduce carbon emissions: for instance, replacement of oil-fired heating with wood-fuelled heating could save over 0.1p for each kg CO_2 that is saved.

1.7 Economics of biomass heating

The economics of wood heating in terms of a pay-back period or the Net Present Value (NPV) is site specific. Wood heating boilers are more expensive than oil or gas boilers by a factor of between 2 - 3. Capital grants to assist with the purchase of boilers as well as finding a good source of wood fuel is key if the life-cycle costs (i.e. capital cost and running costs) are to be competitive. The key elements in evaluating cost-effectiveness are:

- costs of wood fuel versus oil and gas – the bigger the differential in favour of wood fuel, the quicker the higher capital cost of the wood boiler will be paid off. Wood chips are available in many parts of the country at approximately half the cost of heating oil (prices vary however according to world oil prices)
- capital grants – these can reduce the up-front capital costs of the investment
- the heat load – a steady load is better than a seasonal and variable one
- utilisation – how many hours per year is the system used? The greater the hours the more cost effective the system

With carbon emissions now being traded on markets in the UK and soon to be across Europe, this could provide a future income stream to any medium or large project.

Chapter 2 - The biomass industry in Norfolk

2.1 There are some 140,000 hectares of woodland in the East of England, or 7.3% of the total land area. In addition, there are approximately 13.5 million trees outside woodland in the countryside, 14,000 km of hedgerows containing a high proportion of trees and an immense but un-quantified urban tree stock. All told, trees and woodlands form a vital part of the character of the East of England, both rural and urban.

Distribution of woodland over two hectares as at 31st March 2001. (Regional Woodland Strategy Steering Group)

2.2 These existing areas of woodland make a contribution to the region in terms of:

1. Biodiversity and landscape value
2. Social amenity and sporting value
3. Economic value (timber, jobs etc)

The current trend within the woodland sector reflects longer term neglect, with as much as half (more then 40,000 ha) in Norfolk and Suffolk alone unmanaged.

The estimated sustainable productive capacity of small woodland in the region is approximately 205,000 tonnes per annum. This resource has the potential in the short to medium term to be the driver behind growth of the woodfuel industry with farmed energy cropping such as short rotation coppice playing an important part in the longer term.

There are only a handful of biomass fuel producers in Norfolk at the present time. The likely reason for this is the lack of installed biomass power capacity in the County, until users demand biomass fuel, suppliers will not invest in supplying a non-existent market.

2.3 There is however a new regional Anglia Wood Fuel Project that aims to join up the fuel supply chain network at a regional level to enable the secure distribution of quality wood fuel. The project is in the process of purchasing a wood chipper that can be used by local businesses to help reduce costs and pump prime the supply chain at a local level.

2.4 There is also a large fuel supplier on the Norfolk/Suffolk border, M I Edwards at Brandon, who produce woodchips from residues after trees are felled. The company supplies more than 200,000 tonnes of wood fuel from more than 14,000 acres of Forestry Commission land every year. Production has remained steady over the last few years due to a static demand.

TMA Bark Supplies at Weston Longville supplies screened woodchip to a small number of small scale biomass fuel users and Norfolk Wood Recycling Centre Ltd at Mattishall plans to supply woodchip from clean industrial wood by-products. Neither company is prepared to invest significantly until there are enough biomass installations in the County to make wood fuel supply a viable proposition.

There are a number of small scale producers of wood chip and briquettes from waste wood, arboricultural and landscaping activities but, again, investment in production has been halted at the small individual level by a lack of demand for graded fuel.

2.4 Norwich City College is planning to offer short courses (1–2 day) in biomass technologies with a number of full professional development courses in a range of renewable energy technologies including boiler installation.

2.5 At present the level of energy crop production on farms in Norfolk is unknown, but there are a number of farms growing short rotation coppice and miscanthus. Market potential in terms of supply from farming is unknown, but it is potentially a massive resource. One scenario would be a local farm or group of farms growing fuel for utilisation at a local level, either in individual buildings such as schools and care homes or in community heating schemes with a centralised boiler unit providing heat (and ideally power) for homes, public buildings and local businesses.

2.6 The main barrier to the development of the biomass industry in Norfolk is not a lack of supply potential but the lack of demand for biomass fuel. Given strategic planning of new installations and fuel and boiler suppliers involved in project development, there is already a sufficient supply potential for the industry to develop.

2.7 Easton College are looking at training requirements for biomass growers.

2.8 Good potential sites for wood heating include:

- Hospitals
- Leisure centres, public facilities,
- Swimming pools and visitor centres
- Farms
- Business Parks and offices
- Schools and community colleges
- Large country houses
- Residential care homes / sheltered housing
- Industrial users
- Community heating / district heating schemes – especially new developments
- Hotels
- Prisons

CHAPTER 3 - Fuelling Options

3.1 Wood chip

Wood chips are produced from a wide range of sources such as forestry timber, forest co-products, arboricultural thinnings, short rotation coppice, reclaimed timber and sawmill residues. They can be significantly cheaper than fossil fuels and are most economical if sourced locally. Wood chips are suited to larger systems of 30kWh or more. Wood chips stored dry can be held for several years with little degradation of quality or loss of energy value.

3.1.1 Forestry co-products

Forestry and woodland management activities produce a large amount of material suitable for fuel use. These include first thinnings, un-economic thinnings, “lop and top” or timber that is assigned to be wood fuel. Although these are a resource used for nutrients and flotation when on the forest floor, the thinning of woodlands is an essential part of sustainable woodland management. The net effect of bringing under-managed woods back into management for wood-chip production can result in healthier faster growing woodlands and increased biodiversity.

3.1.2 Short Rotation Coppice

Energy crops can be grown to meet the needs of the market and provide a secure long-term resource. The most commonly grown energy crop is willow, usually known as Short Rotation Coppice (SRC). An SRC plantation can often remain viable for up to 30 years. Material is chipped at harvest and can be stored and handled relatively easily. Energy crops and SRC provide wildlife habitats for birds and invertebrates, potentially improving on-farm biodiversity.

3.1.3 Arboricultural thinnings or arisings

Local Authorities and tree surgeons produce many thousands of tonnes of chip and other arisings from amenity and street trees each year. A large proportion of this is currently landfilled – at a cost! With correct handling and grading, this is a virtually “free” fuel source that could be used to provide energy. The infrastructure for this source of fuel is under development in many parts of the U.K. *(see Durham County Council Case Study Page 24)*

3.1.4 Reclaimed timber, pallets and sawmill residues

Clean wood waste, i.e. untreated reclaimed timber,waste pallets and wood industry by-products, can be used as fuel. Many waste recycling/disposal companies now separate out this material prior to waste going to landfill. Making contact with a local recycling/ disposal company can discover a volume of suitable material that they produce each year. Sawmill by-products such as “slab wood off-cuts” can be readily converted into wood chip.

The “Closed Cycle”

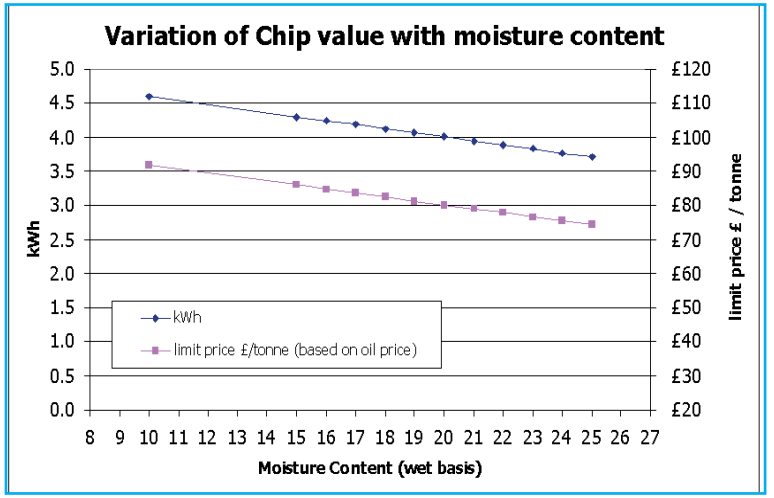
Waste timber collected by a Local Authority has the potential to satisfy that authority’s own demand for wood fuel i.e. a ‘closed cycle’ is possible. The potential reduction in wood waste going to landfill is vast. Community Energy Grants are available to employ consultants to identify and overcome any specific issues preventing implementation of a closed cycle scheme.

Utilising reclaimed timber and waste wood as a fuel source reduces the pressure on landfill sites and contributes to targets for reduction of biodegradable waste going to landfill.

3.1.5 Things to look for when choosing wood chip fuel:

1) Moisture content
2) Calorific value
3) Size of the chip

These will affect the efficiency of the boiler system. The boiler installer or manufacturer will provide a chip specification which best suits the boiler



Fuel Quality Specifications

Moisture Content	<25%
Ash Content	<3% typical
Bulk Density	150<typical<250kg/m3
Energy Content (CV)	see graph
Ash Melting Temperature	avoid soil to minimise clinker
Chip Maximum Size	25-30mm all dimensions
Foreign material	No stones, metal, plastic, glass, etc
Wood treatments	No paints or treatments should be allowed

Taken from British Biogen code of good practice

3.2 Pellets and Logs

In addition to wood chip, two other wood fuels commonly used for heating are wood pellets and logs. Wood pellets are mainly produced from untreated wood waste such as sawdust, pulverised pallets or reclaimed timber. In comparison to other wood based fuels, pellets are more expensive to buy and are currently less readily available. They are however easy to store and handle whilst having a higher calorific value than wood chip.

Pellets can be used in specially designed domestic stoves and boilers; in certain designs of traditional solid fuel boilers, pellets can be burned in place of coal after a small amount of modification. Pellet fuel supply is currently under development in the UK. Imported pellets are available from certain suppliers.

Logs are the most well-known and historically-used wood fuel and are used most efficiently in closed boiler systems, which tend to be smaller scale domestic type systems.

3.2.1 Pelletising Process

The process plant required to produce pellets in general consists of the following stages.

- Feedstock reception
- Chipping
- Final drying (to 10 –15% moisture content)
- Size reduction (typically to 3mm)
- Pelletisation
- Cooling
- Storage, loading and distribution.

The specific flow line used will depend on the nature of the feedstock. In some cases some of these stages can be omitted, e.g. if the feedstock material is exclusively sawdust, there will be no requirement for chipping. The process is well established and proven, and plant is available commercially on a turn-key basis and at a range of different scales, and with differing levels of automation.

Fuel Quality Specifications

Moisture Content	<10%
Diameter	>5mm
Ash Content	1%
Bulk Density	600kg/m3
Energy Content (CV)	>4.7kWh/kg
Ash Melting Temperature	>1100ºC to avoid clinker
Sulphur	300ppm
Chlorine	800ppm
Dust fraction	<1%

taken from: British Biogen code of good practice

wood pellets

logs

CHAPTER 4 - Technology Overview

4.1 Types of combustion technology

Installations fall into one of two categories, either new build or retrofit. The technology currently available is optimised for new builds; however it is possible to retrofit into existing heating systems.

4.2 Two combustion systems are available

A. Underfed Hearth

- From 25kW to 650kW
- Efficiency: 91% at full-load, 92% at part load.
- Utilises drier fuels from 35% MC* down to 10% - chips and pellets
- Fully modulating down to 20% MCR**
- With buffer tank, below 20% MCR in summer
- Automatic ash removal
- Automatic heat exchanger cleaning + EGR***

B. Step Grate System

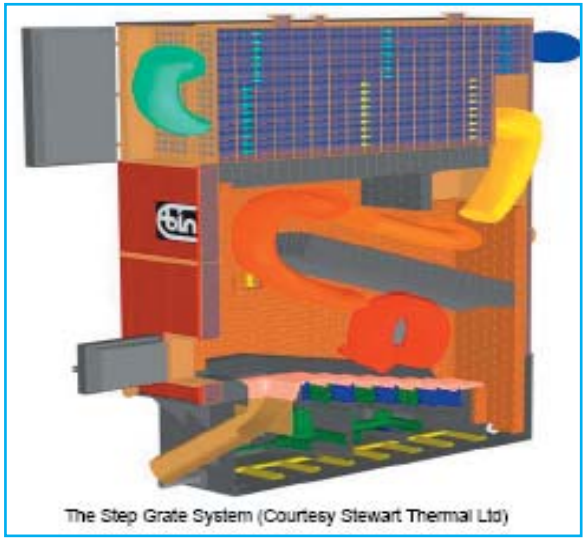
- From 150kW to10MW
- Efficiency: 91% at full-load, 92% at part load.
- Can utilise a wide range of fuels from 55% MC down to 10% - chips and pellets
- Fully modulating down to 40% MCR (or 20% MCR for fuels < 35% mc)
- With buffer tank, below 20% MCR in summer
- Takes 3 hours to come up to operating temperature from cold
- Automatic ash removal
- Automatic heat exchanger cleaning + EGR

***MC - Moisture Content** ****MCR - Maximum Combustion rate**
*****EGR - Exhaust Gas Recirculation**

Key considerations when selecting wood-fuel heating

- How big are the premises?
- How many hours of heating are needed?
- How easy is the access for delivering fuel?
- How much space do you have for storage?
- What fuel sources are available?
- Retrofit or new system?
- How much control do you want over the system?

The underfed hearth system (courtesy Stewart Thermal Ltd)



The Step Grate System (Courtesy Stewart Thermal Ltd)

4.3 Fuel handling

There are three distinct elements within fuel handling: **reception, storage and boiler feed**. All three need to be considered with care, since they impact significantly on the cost of the installation.

4.3.1 Fuel reception

- Access must be appropriate for heavy vehicles
- Tipping or transfer of fuel must be quick and simple

4.3.2 Fuel storage

Underground bunkers

- Best for large scale installations
- Easy to deliver fuel (simple tipping)
- Expensive for small scale systems

Hoppers

- High tip trailer delivery required
- Suitable for situations where space is limited

Hook lift bins

- Suitable for situations where space is limited
- Fuel delivery may be complex

Open store in covered shed

- Easy to deliver fuel
- May be cheapest option
- Transfer of chip to boiler may have to be manual

4.3.3 Boiler Feed System

Transfer of the wood chip from the storage facility to the boiler is critical to the efficient running of the heating system. For smaller installations, chip stored in the open can be transferred to a hopper that feeds the boiler using a materials handler such as a mechanical loading shovel.

Larger systems require an automatic feed from the storage facility to the boiler. These commonly use an auger or walking floor. If the combustion system accepts a wide range of chip size the addition of an agitator to prevent bridging and ensuring a constant feed of fuel to the boiler is a consideration.

How much storage space will be needed?

The volume of fuel that has to be stored will be defined by

1) The size of the system
2) The frequency of fuel delivery
3) The moisture content of the woodchip

It is important to appreciate that storage facilities need to be near to the boiler, unlike oil and gas systems, to permit feeding of the boiler. Ongoing supply of fuel will be easier if the storage system is capable of receiving full loads of wood chip rather than part loads.

Boiler Output		18kW	80kW	350kW
Fuel Input		6.25kg/hr (25kW)	25kg/hr (100kW)	200kg/hr (400kW)
Fuel	1m3	24 hrs	6 hrs	
Storage	4m3	4 days	24 hrs	6 hrs
Capacity	16m3		4 days	24 hrs
	48m3			3 days

NB: Figures provided assume systems are working at maximum output and are derived from the Welsh wood fuel study. Coal-fired systems need to be able store fuel for at least 10 days in case of problems with delivery during winter.

4.3.4 Wood ash can be a useful by-product

Wood burning typically produces less than 1% ash. It can be used as a valuable by-product either as a nitrate fertiliser or as a raw material in brick and cement industries. Ash can be disposed through normal waste collection to landfill or via a waste disposal company if alternative uses cannot be found.

Wood Ash

Key considerations

1) Which combustion system – scale of the system, quality of fuel
2) Location and scale of storage facility – access for vehicles, proximity to boiler, frequency of fuel delivery
3) Boiler feed design – scale of system, nature of storage facility

CHAPTER 5 - Costs

5.1 Capital costs

The capital costs of wood-fuelled systems are higher than for oil or gas, but the outlay is rapidly recovered through lower fuel costs. The pay back time for the extra capital can be as little as three to five years.

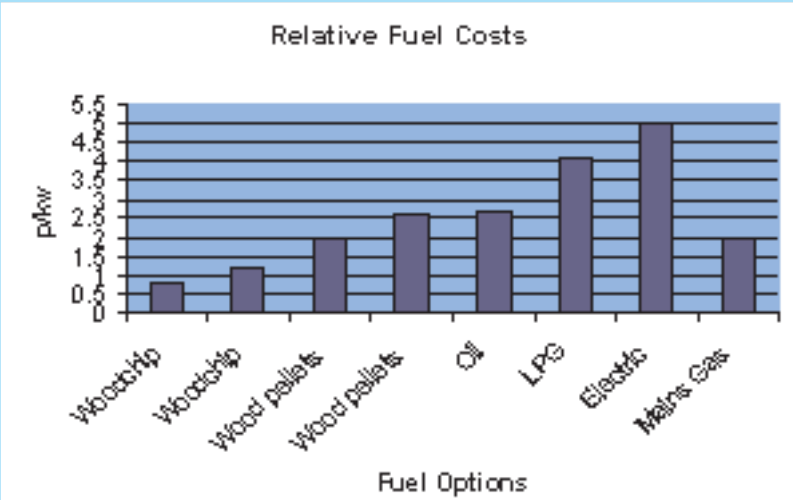
Wood-chip fired heating systems of less than 500kW cost between £180-250 per output kW, but for systems over 500kW, capital costs fall to £150-230 per kW. This covers the core components: the boiler and handling system, flow and return systems and piping. The capital costs of installation of a wood-chip fired heating system are variable and additional costs, such as a fuel reception facility, may add to them. These figures should therefore be seen as a guide only. It is also worth noting that the market for wood-fuelled systems has been quite small in the UK. As wood-chip systems become more widely used, competition and economies of scale will bring prices down.

In recognition of the potential of wood fuel to reduce carbon emissions, there are a number of schemes that will give grant support to help cover capital outlay on renewable energy sources

(See Chapter 9 - Grants for wood fuelled heating).

5.2 Fuel costs

The price of woodchip varies from 1.0 – 1.8 p per kWh. Typically it costs from £20 - £50 per tonne depending on the moisture content, the source of the wood and the distance it has to travel.



Assumptions

- Wood chip £30/tonne (@25% mc)
- Wood chip £50/tonne (@25% mc)
- Wood Pellets £95/tonne
- Wood Pellets £125/tonne
- Heating Oil 30p/litre
- LPG 32p/litre
- Electric 5.5p/kWh
- Mains gas 2p/kWh

5.3 Ongoing maintenance and service costs

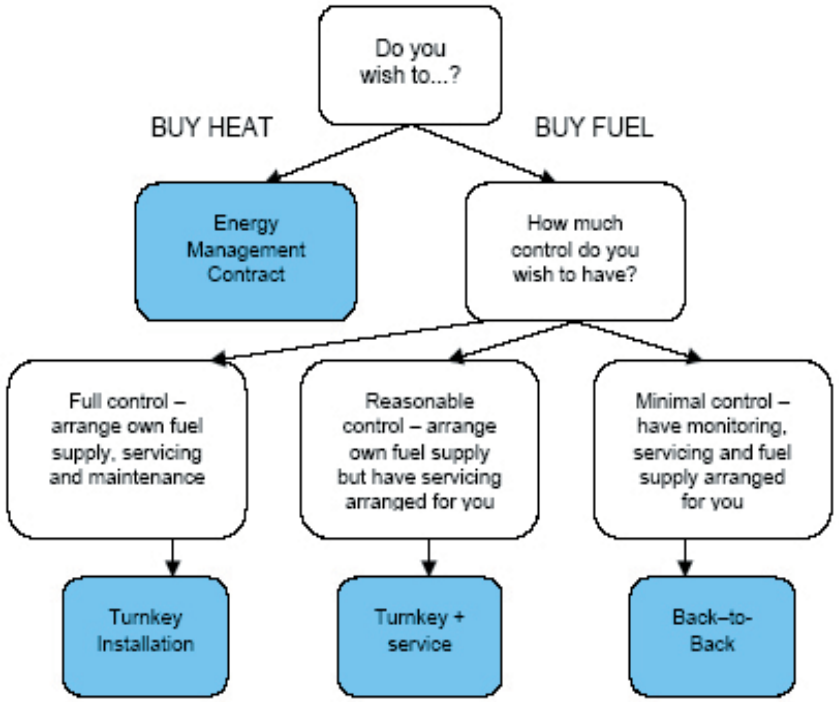
Modern smaller installations are generally fully automated and require minimal attention, whereas larger installations require more regular monitoring and service. A small modern, fully automated boiler system would simply require an annual service, for a fee in the region of £200-500.

Critical factors affecting cost

1) Scale of system: the bigger, the cheaper, the lower the operating costs
2) Engineering, fuel storage and reception area
3) Access to grants

CHAPTER 6 - Contract Options

There are a number of contract options available through fuel and equipment suppliers, as well as Energy Supply Companies (ESCos). Precise cost data for the various contract options is often confidential and varies on a case-by-case basis.



6.1 Turnkey installation

Services:

Contractors simply install the fully functional heating system; all subsequent maintenance and management tasks are down to the user. Fuel and servicing must be sourced independently.

Charges:

The only costs incurred are for the installation and construction. All fuel, maintenance, service and repair costs will be paid in addition to the contract charges.

6.2 Turnkey and service

Services:

Contractors will install the heating system and carry out annual (or regular) services. Extended warranties are often offered with this contract. It is down to the user to source fuel and arrange repairs as necessary.

Charges:

Installation costs and an annual service charge will be incurred; in addition to this, the user will have to pay for fuel and maintenance as necessary. Note that it may be possible to buy the fuel as heat (kWh) rather than by the tonne.

6.3 Back-to-back: turnkey, operations, maintenance and fuel supply

Services:
The contractor installs the heating system and looks after the operations, maintenance and fuel supply. The user is involved in the day-to-day running of the system, although full support and guidance is offered by the contractor.

Charges:
In addition to initial installation costs, the user will pay a standing charge to cover general management and maintenance, and will also pay pro rata for the heat output, per kWh.

6.4 Energy management contract

Services:
An Energy Supply Company (ESCo) installs the system and manages the entire process, including operation, maintenance, fuel supply and day-to-day running. The ESCo remains the owner of the boiler, provides the heat and manages the system. ESCos can also supply the end product (i.e. heat), as opposed to the raw material for on-site energy generation. In this case, the user has no involvement in heat generation; they simply purchase metered renewable heat under an energy supply agreement.

The main control the owner of the building has over the fuel supply is through the heating contract, by including clauses that oblige the ESCo to source a large percentage of the fuel locally.

Charges:
An initial connection fee and ongoing payments for heat output as provided. This concept eliminates the need for high capital outlay as purchase of a new heating system is not necessary.

6.5 Split contract

Services:
A split contract is offered between the boiler supplier and the fuel supplier. The boiler supplier installs and looks after the day to-day running of the boiler and the fuel supplier provides the fuel and arranges deliveries etc. The main consideration is in the event that the boiler feeding system becomes jammed, in which case the user would have to liase with the fuel supply company directly. Likewise any issues with the boiler would have to be resolved directly with the boiler supply company. Under an Energy Management Contract all such issues would have been resolved without the user becoming involved.

Charges:
The boiler supplier will charge an initial installation fee and there will be ongoing service and maintenance costs. The fuel supplier will charge for sourcing and delivering, in addition to the actual wood fuel.

6.6 Key considerations

- **How much control do you want?**
- **Do you want to purchase heat or fuel?**

Chapter 7 - Planning and Regulatory Issues

Many wood chip heating installations do not require planning consent, particularly where they are small and can be incorporated into existing buildings.

The principal issues to be considered are:

- Visual impact, particularly the chimney
- Noise from engines, boilers, handling equipment and traffic
- Local ecology

A Planning Policy Statement specifically relating to wood fuel (PPS 22 08/04: Renewable Energy) is available to guide planners and developers. It is advisable to consult the local planning authority at an early stage to ensure that the installation complies with planning policy. As for all developments, buildings or areas that are designated in planning terms, e.g. Areas of Outstanding Natural Beauty, can raise specific issues.

7.1 Fuel storage and delivery

7.1.1 Traffic

Fuel deliveries are unlikely to significantly increase traffic to the site. Frequency of deliveries will vary, depending on system size, storage capacity and load demand. However, as a guide a 100kW boiler working at full load in winter will require approximately one agricultural trailer load per week or 1 hook bin delivery per month. Good access for heavy vehicles will be essential to minimise disruption to local road networks and surrounding communities.

7.1.2 Storage

- Subterranean bunker – not visible from the ground and therefore not likely to require any planning issues
- Above ground storage - visual impact may be an issue, therefore requires screening and must be secure against unauthorised entry

7.2 Flues/chimneys

Modern wood-fuelled heating systems emit very little smoke. However, like all combustion systems, the chimney of any wood burning installation must be:

- of sufficient height and diameter to remove combustion products from the flue outlet of the boiler;
- of sufficient height to discharge the products of combustion so as not to cause nuisance to people either within or outside the property;
- visually acceptable within planning guidance.

Existing chimneys can be used for retrofit systems, therefore there are unlikely to be any planning issues arising from this option. Existing chimneys can be fitted with a lined flue to ensure their suitability for wood fuelled appliances; vent material must ensure sufficient air movement for efficient operation of the stove. Within a smokeless zone (see ‘emissions’ below) a tall chimney policy will be in place to encourage dispersion of emissions into the atmosphere.

Where installation of chimneys of any significant height are restricted, modern clean-up technology is available to reduce gaseous emissions and eliminate the requirement for dispersion.

7.3 Emissions

Regulatory authorities involved in controlling heating installations:

- < 0.4MW – not subject to control unless in a smoke-free zone
- 0.4MW and 3MW – Local Authority responsible for authorisations
- >3MW – Environment Agency responsible for authorisation

Authorisations for larger scale installations can take up to four months to process; technical details and a breakdown of predicted environmental impacts will be required. In response to urban air pollution issues, the Clean Air Act (1956) created smokeless zones in and around the UK's major cities. It is an offence to emit smoke from a chimney, caused by the burning of an unauthorised fuel or use of an unauthorised appliance. This means that coal, oil or damp wood cannot be used as a fuel unless burnt in a system which is smoke-free.

Modern wood-fired boilers are smoke-free when fuelled with dry wood. It is therefore essential that wood-burning appliances are fuelled by relatively dry material (25-30% MC). Emissions are often restricted to some minutes per day – at both ignition and cool down.

7.4 Building Regulations

Part J of the Building Regulations 'Combustion appliances and fuel storage systems' provides full details of the regulations covering wood-fuelled heating systems. General provisions which apply to combustion installations include safe accommodation, sufficient air supply, good ventilation, provision of appropriate flues and chimneys, re-use of existing flues, safe access to appliances for maintenance and repair.

7.5 Key considerations

- Will the installation cause a visual impact?
- Will traffic to the site increase, how frequently will deliveries be required?
- Is access to the site adequate?
- How and where will fuel be stored?
- Is chimney height likely to be an issue?
- Will the installation be located within a designated area, e.g. smoke-freezone.

Wood-fuel flues can be small. In the above picture, the small chimney in the distance services the woodfuelled appliance and the large chimneys in the foreground belongs to the fossil-fuelled system that it replaced.

Case Studies

Chapter 8 - Case Studies

8.1 Case Study 1 - Onfarm / Domestic Heating

On a 540 hectare arable, dairy and vegetable farm near Wells-next-the-Sea, Norfolk farmer Stephen Temple has had two boilers installed.

8.1.1 Boiler 1

A 37kW Baxi Multi-Heat 4.0 that is used to heat the 5 bedroomed farm house and provide hot water for the dairy and the 120 cow dairy herd. It runs on wood chip, but could also run on wood pellets or grain.

The Baxi boiler was chosen because at the time it was the only boiler Stephen could find that could fire on grain, wood chips and pellets. Before a low cost source of wood chips was found, the intention had been to burn grain grown on the farm. Burning grain as a replacement for oil gives it a value about twice that which could be obtained from feeding it to animals, with no quality constraints.

Farmer Stephen Temple

Woodchip is bought in the summer and comes in at about 30% moisture but dries to below 25% which is suitable for use. The chips can have a diameter of 15 - 30mm or 5 - 50mm with moisture content below 25%. Wetter chips can be made to burn, but not efficently. Each load of chip is about 65 cu metres and last summer two loads were delivered. The chips are stored in old carrot and potato bulk bins.

The Baxi Boiler within the woodchip store

If the Baxi boiler is being used for the house only, its hopper is filled on alternate days. If being used for the dairy as well, it needs refuelling daily. The ash is removed once a week. The fire tubes have to be cleaned out when the control panel indicates; this is usually every month to 6 weeks.

Boiler 1: Facts
Boiler type: 37kW Baxi Multi-Heat 4.0
Fuel: woodchip @ 23 – 30% moisture
Fuel supplier: TMA Bark Supplies
Capital cost: approximately £6,000 including installation
Running costs: £20 per week for house only, £35-£40 for house and dairy

8.1.2 Boiler 2

A 225kW Dragon D25 straw fired boiler which has been modified by Stephen to suit his operation, with a variable speed and control system.

This boiler was intended for annual grain drying, mainly for 4-6 weeks in August/September, at full output only. Therefore a low capital cost was the prime consideration.

Dragon boiler for grain drying

Boiler 2: Facts
Boiler type: 225kW Dragon D25 with modifications
Fuel: woodchip and straw grown on farm
Fuel supplier: n/a
Capital cost: approximately £11k including installation
Running costs: £ n/a

Fuel Supply

The straw for the Dragon boiler is grown on-farm and is wheat straw (for preference) or barley straw. As long as it is not wet, the type of straw (wheat, barley, hemp, miscanthus etc) is not important.

Costs

The Dragon boiler and heat exchanger cost around £10,000. In addition, pipe work and a circulation pump was required.

Maintenance

At full output the Dragon boiler uses 4 large round bales a day. De-ashing needs to be done once per week at full output.

For visits / demonstrations contact Stephen Temple:-
sjt@jftemple.co.uk

8.2 Case Study 2 - The National Trust Headquarters, Westley, Bury-St-Edmunds

On the 1st December 2004, the National Trust installed a 60kW state of the art woodfuelled heating system at its Regional Headquarters at Westley, near Bury St Edmunds. The Centre, a block of converted farm buildings, includes 850m_2 of office space and the system services the underfloor heating system and hot water.

8.2.1 Fuel supply

Softwood is harvested using sustainable woodland management practices from the Trust's Ickworth estate 2 miles away. It is felled in March and stored by the roadside until September, when it is transported to a local farm for chipping and storage. Woodchip is delivered to the hopper once a week in winter and once every eight weeks in summer.

8.2.2 Technology

The heating installation is housed within the barn conversion outbuildings which required little modification.

The system is user friendly; an intelligent control system minimises pressures on staff to maintain and monitor the installation and ensures that the system is running at optimal output. There is a warning alarm outside the building which illuminates if there are any problems.

Boiler Room and woodchip storage hopper

8.2.3 Maintenance

Ash collection is automatic and a bucketful is removed once per week at the peak of use. There is a computer readout for monitoring all variables and an emergency dampener which discharges two gallons of water to the firebox in emergencies.

The Trust entered into a service contract with the installers, Econergy, whereby the company install and commissions the boiler and services the system once or possibly twice a year depending on the level of use.

The Trust is responsible for all other elements of the system: fuel, de-ashing, etc. (estimated at around ½ hour per week).

Key Facts	
Year installed	2004
Size of building	850 m_2
Boiler type	KWB USV 60
Thermal output	60kW
Fuel	Estate woodchip
Capital cost	£40,000
Grant	£10,000
Installer	Econergy

Quote:

"Would I recommend one?
Unreservedly yes…I am very pleased to be able to uphold this particular set of Trust values…the more you understand the performance outputs and how it works the better you will be able to manage it and deal with faults"

Richard Hill, Projects Manager,
National Trust

8.3 Case Study 3 - Bayfield Hall, Norfolk

In March 2005, the owners of Bayfield Hall near Holt, Norfolk installed a brand new 65kW wood-fuelled heating system. The heating system services a twelve bedroom hall, a 4 bedroom self-contained flat and approximately 190 m_2 of converted stable block. They also plan to build a swimming pool in the summer when their demand for heat is low.

Bayfield Hall

Key Facts	
Year installed	2005
Size of building	16 bed house +190 m_2
Boiler type	KWB USV 65
Thermal output	65kW
Fuel	Own and local estate woodchip
Capital cost	£35,000
Grant	25%
Installer	Econergy

8.3.1 Fuel supply

Wood is harvested from thinnings on the Bayfield Hall estate, supplemented with wood from other local estates, and chipped near the storage barn, using a chipper hired from Sheffield City Council. Around 80 tonnes of woodchip is stored in a grain barn on the estate. The boiler room also houses the fuel store but access is limited, so two trailer loads (1.5 – 2 tonnes) of chip are added to the fuel store each month via a converted potato elevator and hopper (pictured). The fuel quality is paramount for this system to work at optimum performance and chip moisture cannot be above 30-35% without causing problems.

potato elevator and revolving arm auger feed

woodchip hopper and converted potato elevator

8.3.2 Technology

The heating installation is housed within the old boiler house.

The system is user friendly. An intelligent control system minimises the need for the owner to maintain and monitor the installation and ensures that the system is running at optimal output.

Oil backup boiler, ashcan and biomass boiler

8.3.3 Maintenance

Ash collection is automatic and a dustbin-full is removed once every 2 months at peak use. There is a computer readout for monitoring all variables and an emergency dampener which discharges 2 gallons of water to the firebox in emergencies.

The owner entered into a turnkey service contract with the installers, Econergy, who install and commission the boiler and service the system once or occassionally twice a year depending on the level of use. The owner is responsible for all other elements of the system: fuel, de-ashing etc. (estimated at around 30 minutes work per week). At current prices the owner is anticipating a 5 – 7 year payback against his old oil boiler, less if oil prices continue to rise.

Quote:

"I chose this boiler system because it is totally hassle free. Monitoring and maintenance are minimal, we have unlimited hot water and the house is heated 24 hours a day."

Roger Combe, owner, Bayfield Hall.

8.4 Case Study 4 - Lee Moor Farm, Northumberland

With the economics of farming becoming harder to balance, the buzz word of recent years for the farming community has been diversification. This was precisely what Ian Brown, farmer at Lee Moor did by converting his redundant farm buildings into a business park.

With all the old farm buildings requiring new heating systems, the option of a district heating system, and therefore the possibility of utilising wood fuel, became viable. Although a biomass heating system is more expensive to install than oil, the cheaper running costs, plus the ability to sell heat to tenants, means the system is more economical in the medium term than individual systems.

Key Facts	
Capacity	80kW
Fuel	Woodchip @ 23 – 35% moisture; Wood chip sourced from local supplier/tree surgeon business park tenant
Capital cost	approx £30,000
Running costs	160T @ £37.50/T + maintenance
Heat price	2.5p/k Wh
CO_2 emissions saved	60T/year
Source of grants	25%European LEADER Programme for capital costs, British Biogen/European ALTENER programme for feasibility study
Maintenance	Filling the hopper: 10 minutes every 7 days. Cleaning the boiler: 5 minutes once every 2 days.

8.4.1 Fuel supply

The intention is for the fuel to be chips produced from trees grown on site. The fuel and boiler are situated in a disused silage pit which has been roofed over. The wood chip is put into a hopper once a week which automatically feeds into the boiler as it is needed. The water is circulated to buildings through underground insulated pipes heating sixty radiators and five hot water cisterns.

Lee Moor Farm

8.4.2 Benefits of the project

- cheaper than alternative fuel sources
- low maintenance
- potential for future expansion if further buildings are developed
- attractive to environmentally minded businesses
- low environmental impact, low CO_2 emissions
- local economy benefits by keeping fuel supplies local and supporting local jobs
- the system is monitored and controlled from the farm office

8.4.3 Lessons Learned

- a totally new heating system had to be installed, including radiators, increasing costs.
- locating a fuel supply - Lee Moor is growing its own fuel using the Energy Crops Scheme and adding value on site by selling heat.

Further Information
Ian Brown, Lee Moor Farm: 01665 577 253
www.northenergy.co.uk, 01670 516949

Quote
"The scheme has allowed us to reduce CO_2 emissions and provide a valuable service to our tenants. I would highly recommend systems of this type."

Ian Brown, Lee Moor Farm

8.5 Case Study 5 - Durham County Council: an example of Best Practice

8.5.1 The North East Regional Energy Strategy was published by the Northern Energy Initiative (TNEI) in 1999. Durham County Council is responding to the objectives set out in the strategy in a number of ways:

- Improving energy efficiency in its own buildings and services
- Promoting and demonstrating aspects of energy efficiency and renewable energy through other key plans and strategies (e.g. the County Durham Economic Development Strategy, the County Durham Local Transport Plan and the County Durham Sustainable Waste Management Strategy).
- Organising events for raising public awareness of energy issues, technologies and good practice

The County Council's Energy Management Unit is regularly audited by the District Auditor who concluded that "in comparative terms Durham is a good practice authority". The County Council has also been accredited under the Energy Efficiency Accreditation Scheme - the first County Council to receive this recognition.

8.5.2 Energy management in County Council buildings

The Energy Management Unit at County Hall is responsible for managing the energy use in approximately 500 council properties, with a combined annual energy bill of over £3.5m.

The following are examples of measures taken in recent years - many of which could be repeated by other organisations.

- The County Council's waste contractor diverts waste wood from landfill and converts it to wood pellets for firing boilers in four schools. (See following case studies)
- Boilers at 24 sites have been converted from solid fuel to gas firing, reducing energy consumption by 25% and CO_2 emissions by 40%. Maintenance costs have also been substantially reduced. A policy is in place to completely phase out solid fuel and oil-fuelled boilers by 2005
- Boiler plants at four schools have been converted from solid fuel to run on wood pellets derived from clean waste wood
- A state of the art biomass boiler plant has been installed at Cassop Primary School
- A 50kwh wind turbine has been installed at an existing school, and a 20kwh wind turbine has been installed at a new school
- 2 new schools utilise rainwater for flushing WC's
- The installation of cavity wall insulation at schools and social services residential homes has improved comfort and reduced energy consumption by 10%
- Installation of swimming pool covers at 22 pools has reduced energy consumption by 20%
- 29,000, 100 watt tungsten light bulbs have been replaced with 23 watt compact fluorescent lights, each saving £60 over its life
- A microturbine combined heat and power unit has been installed at County Hall

8.5.3 Durham County Council

The Council has a policy to phase out solid fuel (coal fired) heating systems by 2005. Many solid fuel boilers have been converted to gas firing but in areas where there is no gas service an alternative fuel has had to be found.

Premier Products, a part of Durham County Council's waste management company, Premier Waste, has developed a wood pellet made from wood, which would have otherwise been put into landfill. Clean wood is crushed and magnets remove any metal. After manual checking, the wood passes through a hammer mill and a screening process. The wood chips thus produced are supplied to a chipboard manufacturer. The screened fines are pelletised in a CPM pellet mill. The pellets are subject to a rigorous quality control system and comply with the British BioGen code of good practice.

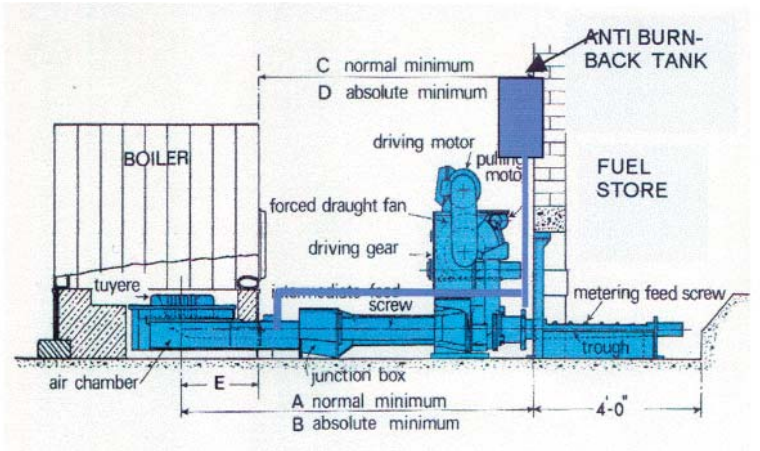
There are currently three schools where pellets are being used; these are Ferryhill School and Online Centre, Staindrop Comprehensive School and Trinity Bek Special School. Ferryhill School and Online Centre was the first to be trialled. This school had three solid fuel boilers but it was not possible to convert them all to gas firing because the gas supply was insufficient to feed them. Therefore two were converted to gas and the third was converted to wood pellet firing. The wood boiler is the lead boiler and the two gas boilers are used to back it up as demand increases

8.5.4 How it works

The converted boiler is a Hartley and Sugden SCF 200 rated at 585kW, underfed by a James Scott stoker modified by CES/ELYO and Ian Chappell in 2001 as part of Durham County Council's programme of wood pellet conversions.

The SCF 200 is an efficient boiler with a system of heat exchange tubes around the upper half of the boiler. In the combustion chamber, the fire burns in a rectangular retort surrounded by tuyeres which direct the forced draught primary air to the centre of the fire. Secondary air is supplied over the fire and through holes drilled in the door.

Wood pellets are stored in a bunker adjacent to the boilers. They are conveyed to the boiler by a screw feed to the centre of the combustion chamber. An anti-burn back device has been added to the feed pipe to prevent fire spreading back along the stoker into the bunker. If fire is detected in a feed pipe, a heat thermostat opens a valve in a pipe carrying water from a tank to the stoker and dowses the fire.



SCF 200 Boiler

8.5.5 Storage

Pellets are delivered to the school fuel store by a pneumatic animal feed wagon and blown in through the existing coal feed pipes. The flat bottoms to the stores have now been profiled with sheet steel at an angle of 54° to help the pellets flow down onto the worm feed screw.

8.5.6 Maintenance

Half a dustbin of ash is removed manually twice a week. Once a month the tubes are cleaned out and the whole system inspected. The stoker has been refurbished and is not expected to require any maintenance for several years. Occasionally, if a foreign body should get into the pellets a blockage may occur, a shear pin will break which causes a stoppage. The blockage is easily removed and the pin is simply replaced.

8.5.7 Economics

The calorific value of the pellets is approximately 60% that of coal (17.5GJ/tonne compared to 29GJ/tonne for coal). Therefore more tonnes of wood have to be burned to achieve the same heat output. The cost of burning pellets at the school is slightly more than burning coal at present, but is cheaper than gas at April 2002 prices. As fossil fuel prices continue to rise and pellet prices become cheaper through bulk manufacture, pellets should become more competitive. Wood fuel is also exempt from Climate Change Levy. The school and Durham County Council are pleased with the performance of the wood pellet boiler. They are glad to be able to save CO_2 emissions and reduce landfill. The caretaker's work is also reduced.

County Durham Environmental Trust, ETSU for the DTI, Durham County Council and Business Link assisted the cost of fuel research, the boiler conversion and experimental work. The project was managed in partnership with North Energy Associates and Durham County Council. Some boiler replacements in the future will look at using wood pellets as the main fuel source, while conversions of existing plant from coal to wood pellet burning will be considered at three other schools.

Contact:
Jeff Kirton
Energy Manager,
Durham County Council,
County Hall
Durham DH1 5QU
(Tel 0191383 3749)
E-mail jeff.kirton@durham.gov.uk

Pellets:
Kevin Owens
Premier Waste
Aykley Heads
Durham
(Tel 0191 377 9460)
E-mail
kevin.owens@premierwaste. com

North Energy:
Nicola Smith
North Energy Associates,
Old Queens Head Yard
7B Oldgate, Morpeth.
Northumberland NE61 1PY
(Tel 01670 516949)
E-mail
enquiries@northenergy.co.uk

Boiler Importer:
3G Energi
Allesudden
Charlesfield
St Boswells
Melrose
(Tel 01835 824201)

8.6 Case Study 6 - Cassop School, County Durham

The first specialist wood-burning boiler from Austria has recently been installed in Cassop Primary School in Durham.

8.6.1 Educational benefits

Cassop Primary School has received a new boiler manufactured by KOB in Austria, which replaces the old oil-fired boiler at the school. The boiler will use wood pellet fuel, produced locally at the council's waste contractor, Premier Waste's Coxhoe site. The new boiler is already being used as a tool for learning. The pupils have learnt how the wood pellet fuel is produced and how it is renewable, and also have tracked the journey of the new boiler from its place of manufacture to their school, learning about the geography of foreign countries and international transport links.

8.6.2 Other energy products at the school

The school also has a 50kW wind turbine and was the first school turbine in the UK to be grid-connected. Power produced out of school hours is exported to the grid and sold back to the Electricity supplier. Prime Minister, Tony Blair switched on the turbine in 1999.

8.6.3 Storage

The new KOB wood-burning boiler arrived at Cassop Primary School, having been transported by road from Wolfurt in Austria. A mobile crane was needed to off-load the boiler and maneouvre it into the existing boiler house. The adjacent oil-storage tank house has been modified to store the wood pellet fuel by removing the oil tank and constructing a sloping floor in line with the new auger to the boiler. A revolving dish in the centre of the floor, driven from the end of the auger, has sprung metal arms which sweep the wood fuel into the worm drive to feed the boiler.

8.6.4 Economics

The calorific value of the pellets is approximately 60% of coal (17.5 GJ/tonne compared to 29 GJ/tonne for coal). Therefore more tonnes of wood have to be burned to get the same heat output. The cost of burning pellets at the school is slightly more than burning oil at present but cheaper than gas at April 2002 prices. As fossil fuel prices continue to rise and pellet prices become cheaper through bulk manufacture, pellets should become more competitive. Wood fuel is exempt from Climate Change Levy.

receiving the KOP boiler

Chapter 9 - Grants for wood fuelled heating

There are various sources of grant aid for feasibility studies, planning, installation and management of wood fuelled heating systems. When applying for financial assistance, it is important to consider the length and complexity of the application process, the timescales and deadlines for applications. Various options are outlined.

9.1 Implementation

9.1.1 Clear Skies Renewable Energy Grants – Householders

Funded by DTI and managed by BRE, the grant scheme aims to give householders,communities and Local Authorities a chance to realise the benefits of renewable energy by providing grants and access to sources of advice.

Householders can obtain grants from £400 to £5000 whilst not-for-profit community organisations can receive up to £50,000 as grants.

Community grants areavailable to environmental trusts, housing associations, local authorities, universities,hospitals and other public service organisations. Community grants are available in four funding rounds each year. Community groups are eligible to receive 75% of the cost of feasibility studies or £10,000, whichever is the lower.

Scale of funding:
50% or £50,000, the lower rate is paid regardless of technology used

Contact :
Clear Skies,
BRE Ltd,
Building 17
Garston
Watford
WD25 9XX
Tel: 08702 430930
email: info@clear-skies.org
web: http://www.clear-skies.org

9.1.2 Energy Saving Trust : Community Energy

Provides funding and support for the Public Sector for the installation of Community Heating schemes;

The Energy Saving Trust and Carbon Trust jointly run a support programme providing guidance and funding for the installation and refurbishment of community heating schemes in the public sector across the UK. £50M in grants has already been successfully allocated to develop and implement community energy projects.

The government has recently announced a further £10M in grants to support community energy projects. Details of how to apply for this new funding will be released early in 2006.

Contact :
Energy Saving Trust
21 Dartmouth Street,
London.SW1H 9BP
Tel: 0870 850 6085
email: communityenergy@est.co.uk
web: http://www.est.org.uk/housingbuild-ings/communityenergy/

9.1.3 Action Energy Loan

The interest free Energy-Efficiency Loan scheme is a significant £10M programme to encourage investment in energy efficiency, and is run by the Carbon Trust. This independent, not for profit company set up by the Government, works with UK businesses and the public sector to cut carbon emissions through practical advice and support.

Available for SME's with a trading record of more than 12 months and for all energy saving investments, including building technologies and industrial process technologies

Scale of funding:
0% interest loans available from £5,000 to £100,000 for the purchase of energy-saving equipment

Contact:
Action Energy
c/o The Carbon Trust,
9th Floor, 3 Clement's Inn,
London,WC2A 2AZ
Tel: 0800 58 57 94
web: http://www.actionenergyloans.org.uk/

9.1.4 Community Renewables Initiative

In each of 10 different areas of England, a partnership of organisations has been formed to help localities devise their own ideas and developments for renewable energy.

No direct funding is available.

The Community Renewables Initiative is available to help track down suitable funding and assist with applications as appropriate. Guidance is offered at all stages from planning through to implementation.

Contact:
Regional Enquiry Service,
Community Renewables Initiative
Norfolk, Suffolk, Cambridgeshire
Tel: 01733 567522
email: ed.knox@angliaenergyadvice.org.uk

National Enquiry Service,
Community Renewables Initiative
Tel: 01242 533260
email: cri@countryside.org.uk

9.1.5 Innovation Programme

Two routes of funding are available through the Energy Saving Trust for feasibility studies and implementation projects that reduce carbon emissions.

Scale of funding:
Up to 70% of project costs are available to a maximum of £10k, for implementation grants up to 50% of costs are available to a maximum of £90k.

Contact:
Innovation Programme
Energy Saving Trust
c/o Future Energy Solutions,
153 Harwell,
Didcot,
Oxfordshire,
OX11 0QJ
Tel: 01235 432432
email: innovation.programme@aeat.co.uk
web: www.est.org.uk/housingbuildings/localauthorities/?initiative_id=16

Chapter 10 - Useful Contacts

10.1 Norfolk woodchip suppliers

Anglia Wood Fuel Project
Gary Battell
Suffolk County Council
Endevour House
8 Russell Road
Ipswich
IP1 2BX

MI Edwards
Mundford Road
Brandon
Suffolk
IP27 0PL
United Kingdom
Tel:01842 813555

Norfolk Wood Recycling Centre Ltd
Kensington Forge
Mattishall
Dereham
Norfolk
NR20 3PD
Contact Paul Plumber
Tel: 07768 451006
email: norfolkwood@btconnect.com

TMA Bark Supplies
Mill Farm Bungalow,
Mill Street,
Elsing Nr Dereham,
Norfolk,
NR20 3EQ
Contact: Graham Andrews
Tel: 01362 638441 or 07860 379510
email: tma@ukgateway.net

10.2 Chip and pellet suppliers

Renewable Fuels Ltd
The Hackings
The Menagerie
Escrick
York
YO19 6ET
Tel: 01904 720575
Contact Bob Smith M.D.

3GEnergi
3 The Knowes
Kelso
Scotland.
TD5 7BH
Tel: 01573 229198
08000 835949
email: info@3genergi.co.uk

A.T Osbourne Ltd
Shelley Lane
Ower
Romsey
Hants
SO51 6LZ
Tel: 02380 814340
e-mail: markosbourne@atosbourneltd.free-serve.co.uk

Bed - Down
Cherry Tree Farm, The Common
Metfield
Harleston
Norfolk IP20 0LP
Tel: 01986 785278
web: bed-down.co.uk

EBC
Unit 10b, Bunns Bank Ind Est
Attleborough
Norfolk
NR17 1QD
Tel: 01953 455854
www.ebc-ecofuel.co.uk

10.3 Equipment suppliers

Wood Energy Ltd
Little Domick,
Staplefield Lane,
Warninglid,
Haywards Heath
West Sussex
H17 5SR
Contact: Stewart Boyle
Tel: 01444 461183 or 07785 726 306
email: stewart@woodenergyltd.co.uk
web: www.woodenergyltd.co.uk

Design, installation and service of automatic wood-fired heating systems using wood chip or wood pellets

3G Energi
Allesudden, Charlesfield
St. Boswells
Melrose
TD6 0HH
Contact: Gavin Gulliver-Goodall
Tel: 01835 824201
email: gavin@3genergi.co.uk
web: www.3genergi.co.uk

UK importers of Kob and Kunzel wood fuelled central heating boilers (domestic and commercial); logs, pellet and woodchip. Design and installation packages are available.

Econergy
69 Hampton Park
Bristol
BS6 6LQ
Contact: Robert Rippengale
Tel: 0870 054 5554
Email: heat@econergy.ltd.uk
Web: www.econergy.ltd.uk

Specialise in the specification and supply of turnkey biomass heating systems. Also source, process and supply woodfuel and offer Contract Energy Management services.Consultants and engineers for wood fuelled heating systems, from planning and design through to installation and maintenance.

Stewart Thermal Limited
Market Farm Barn
Market Lane
Burston,
Diss
Norfolk,
IP22 5TR
Contact : Len Hobson
tel: 01379 741033
email: Info@StewartThermal.co.uk
web: http://www.stewartthermal.co.uk

Design review, project feasibility studies, commissioning, operating and engineering management of steam and electricity generating plant

Foundation Firewood
39B Park Farm Industrial Estate,
Buntingford,
Herts
SG9 9AZ
Contact Joe Zygmunt
Tel: 01763 271271
E-mail info@fbcgroup.co.uk
web: www.fbcgroup.co.uk/baxi.html

Suppliers of Baxi Boilers

Iron Works
16 Fairland Street
Wymondham
Norfolk
NR18 0AW
Tel: 01953 602482

Multifuel and woodburning stoves

PLC Products
Westhall
Halesworth
Suffolk,
IP19 8RH
Tel/Fax: 01502 575265

Clifton B10 Bio-Compactors.
Use waste wood chips, sawdust, shavings, MDF, agricultural wastes etc. Make better, denser fuel logs and better, denser feed blocks.

Talbott's Heating Ltd
Drummond Road
Astonfields Industrial Estate
Stafford
Staffordshire
ST16 3HJ
Contact: Amy Talbott
Tel: 01785 213366
Email: amy.talbott@talbotts.co.uk
Web: www.talbotts.co.uk

Established biomass fuelled energy system manufacturers. Units available from 25kW to 12MW.

Bioflame Engineering
Manor Farm
Levisham
Pickering
North Yorkshire
YO18 7JN
Contact: Victor Buchanan
Tel: 01653 668223
Web: www.bioflame.com

Manufacturer of biomass burners

J Riley Beet Harvesters UK Ltd
Church Farm
Attlebridge
Norwich
NR9 5ST
Tel: 01603 262526
web: www.riley-reko.co.uk

Importer of REKA boilers

Murray Carter
Ingerthorpe Hall Farm
Markington
Harrogate
N.Yorks
HG3 3PD
Tel: 01765 677887

Supplies planting and harvesting equipment and small scale gasification and pellet burning appliances.

Dragon Energy from Waste
Station Road
Sibsey
Boston
Lincolnshire
PE22 0SA
Contact: Peter Mowbray
tel:01205 750516
email: peter@dragonheat.co.uk
web: http://www.dragonheat.co.uk

Hot water from any waste. Payback within 2 years.

Barn Owl Monitoring and Control
Martin Lishman
Unit 2B
Roman Bank
Bourne
Lincs
PE10 9LA
Tel: 01778 426600
Fax : 01778 426555

Monitoring and control equipment

Renewable Heat & Power Ltd
Pinkworthy Barn
Oakford
Tiverton
Devon
EX16 9EU
Tel: 01398-35116601398-351115
email: webreply@rhpl.co.uk

Supply biomass fuel, boilers, chippers, pelletising machines and ancillary equipment

Dulas Ltd
Unit 1, Dyfi Eco Parc
Machynlleth
Powys
Wales
SY20 8AX
Tel: 01654 705000
web: enquiry@dulas.org.uk

Initial feasibility studies, technical design, complete turnkey installation, or contract energy services. Log and pellet boilers for domestic application, multizone pellet and chip boilers for commercial and industrial installation

Disclaimer: This is not an exhaustive list, inclusion does not constitute recommendation.

10.4 A number of companies offer tailored energy supply, design, installation and consultancy services as well as a wide range of boilers and materials handling equipment.

Some examples follow:

Log Boilers:

Fröling FHG Range -

Highly efficient modulating log boilers from 15kW to 70kW

Pellet Boilers:

Rika Pellet Stoves -

Automatic wood pellet stoves for room and central heating

KWB USP Range -

Fully automatic wood pellet boilers from 10kW to 30kW

Woodchip Boilers:

KWB USV Range -

Fully automatic woodchip/pellet boilers from 15kW to 100kW

Veto Range -

Automatic woodchip stoker-boilers from 30kW to 250kW

Fröling Range -

Fully automatic woodchip/pellet boilers from 28 to 500kW

Compte Range -

Automatic woodchip boilers from 320 to 5,000kW

Woodfuel Processing and Handling:

Mus-Max Woodfuel Chippers -

Tried and tested chipping machinery for professionals

Mus-Max Woodchip Blowers -

A range of proven woodchip blowers from Austria

Moisture Meters -

Fast and accurate woodchip moisture testing

10.5 Clear Skies registered boiler installers

Solarworks
Frogs Hall Road
Lavenham
Sudbury
Suffolk
CO10 9QH
Tel: 0800 7 814004
Email: mail@solarworks-uk.com

Solar thermal, wood pellet stoves

Rural Energy
Manor Farm
Main Street
Oakham
Leicestershire
LE15 8DH
Tel: 01664 454989
Email: info@ruralenergy.co.uk

Solar thermal, wood pellet stoves, wood fuelled boilers

Foundation Firewood
39B Park Farm Industrial Estate,
Buntingford,
Herts
SG9 9AZ
Tel: 01763 271271
Email: info@fbcgroup.co.uk
www.fbcgroup.co.uk/baxi.html
Contact Joe Zygmunt

Jones Nash
12 Lee Street
Louth
Lincolnshire
LN11 9HJ
Tel: 0845 345 2049
Email: sducker@jonesnash.demon.co.uk
Wood pellet stoves, wood fuelled boilers

Green Systems
43 New Road
Melbourne
Royston
Hertfordshire
SG8 6BX
Tel: 01763 260719
Email: info@greensystemsuk.com
Solar thermal, wood pellet stoves, wood fuelled boilers

10.6 Organisations

Anglian Woodland Project
Gerry Barnes
Norfolk County Council
Dept of Planning and Transportation
Martineau Lane
Norwich
NR1 2DH
Tel: 01603 222764
Email: gerry.barnes@norfolk.gov.uk

Combined Heat and Power Association
Grosvenor Gardens House
35/37 Grosvenor Gardens
London
SW1W 0BS
Tel: 44 020 7828 4077
E-mail: info @ chpa.co.uk

The National Energy Foundation
Davy Avenue
Knowlhill
Milton Keynes
MK5 8NG
Tel: 01908 665555
Fax: 01908 665577
E-mail: info@nef.org.uk
http://www.nef.org.uk/logpile/

Renewable Energy Growers Ltd
Manor Park,
Top Street,
East Drayton,
Retford,
Notts
Tel: 01777 248 684
Email: info@energycrop.co.uk
http://www.energycrop.co.uk/

National Non-Food Crops Centre
Biocentre,
Innovation Way,
York Science Park,
Heslington,
York,
YO10 5DG
Tel: 01904 435182
Fax: 01904 435345
Email: enquiries@nnfcc.co.uk
Web: http://www.nnfcc.co.uk

Cont.. **Organisations**

Renewable Energy Association
17 Waterloo Place,
London
SW1Y 4AR
Tel: 020 7747 1830
Web: http://www.r-e-a.net
Contact: Peter Billins
Head of Biomass

Renewables East
Zicer Building
School of Environmental Sciences
University of East Anglia
Norwich
NR4 7TJ
Tel: 01603 591415
Web: www.renewableseast.org.uk
Contact: Richard Parker
Development Director
Bioenergy

Defra – Energy Crops Section
Rural Development Service
Electra Way
Crewe
CW1 6GL
Tel: 01270 754000
Fax: 01270 754088
Email: organic-energy@defra.gsi.gov.uk

Chapter 11 - References and Useful Websites

11.1 Reference List

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Rippengall, R, 2003. “Woodfuel in the East of England Prospects and Potential”, Econergy Ltd

Strawson, J, 2004. “Energy Crops in the UK and Lessons from Abroad”. Renewable Energy Growers Ltd.

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Gill, B, Roberts, J, Hartley, N, Clayton, D, 2005. “Interim Report”. Biomass Task Force.

Gill, B, Roberts, J, Hartley, N, Clayton, D, 2005. “Conclusions and Draft Recommendations”. Biomass Task Force.

Cotton, R. 2004. “Wood Pellet Production in the U.K”. Renewable Heat and Power Ltd

Boyle, S, 2005. “Heating with Biomass and Solar: A Practical Solution”. Wood Energy Ltd

Boyle, S, 2005. “Heating with Biomass: Some Success Stories ”. Wood Energy Ltd

“Renewables East Biomass Foundation Study” website November 2005

Sir Ben Gill “Biomass Task Force Report” October 2005

Carbon Trust - Biomass Sector Review October 2005

11.2 Websites

http://www.renewableseast.org.uk

http://www.logpile.org.uk - aims to promote and aid the use of wood as a source of renewable energy.

http://www.woodenergyltd.co.uk/ - biomass boiler installers. Systems ranging from 25kW to 10,000kW

http://www.rhpl.co.uk/ - Renewable Heat and Power Ltd.

http://www.3genergi.co.uk/ - 3G Energi

http://www.econergy.ltd.uk/ - Econergy

http://woodfuelwales.org.uk/biomass/ - biomass – all you need to know

http://www.clear-skies.org/ - Clear Skies – Renewable Energy Grants

http://www.defra.gov.uk/farm/acu/energy/energy.htm - Defra – Bio-Energy

http://www.dti.gov.uk/renewables/renew_2.1.htm - DTI – Renewable Energy

http://www.est.org.uk/ - Energy Saving Trust

http://www.forestry.gov.uk/srcsite/HCOU-5JENMU - Forest Research – measurement and modelling or SRC

http://www.woodlandforlife.net/wfl-woodbank/displayarticle.asp?id=5049 – report “Woodfuel in the East of England – Prospects and Potential”

http://www.woodfuelresource.org.uk/ - Forest Research: Woodfuel Resource – study into the potentially available woodfuel resource of Great Britain

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