



**CENTRE FOR
SUSTAINABLE
ENERGY**



Avon and Somerset Biomass Heating Feasibility Study for the Innovations Programme

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- Centre for Sustainable Energy (Project Manager)
- Local Authorities:
 - South Gloucestershire Council (Lead partner)
 - Bath & North East Somerset Council
 - North Somerset Council
 - South Somerset Council
 - Mendip District Council
 - Taunton Dean Borough Council
 - Sedgemoor District Council
- Renewable Heat & Power Ltd.
- South-West Wood Fuels Ltd.
- New Perspectives Ltd.

EXECUTIVE SUMMARY

The Avon and Somerset Biomass Heating Feasibility Study proposed to investigate the methods required to stimulate the adoption of high efficiency small-scale automatic wood-fired heating systems in the former Avon and Somerset region. Funded by the Energy Savings Trust Innovations Programme and Local Authority partners within the region, the study principally targeted households using inefficient oil, LPG or solid fuel heating appliances in those areas without access to mains gas. The main aim was to assess the potential level of uptake of biomass heating systems within these areas by identifying the barriers to successful implementation, and the incentives needed to overcome these barriers.

Automatic wood-fired heating remains in its infancy in the UK in spite of its social, economic and environmental benefits over fossil fuels and the rapid expansion of the technology in northern Europe. The technology is now well developed and uses fuel that contributes close to zero net carbon dioxide emissions when obtained from a sustainable source. Fuel is produced in the form of wood chip or wood pellets and typically uses 'green' wood residues or untreated recycled wood as the raw material. Appliances for domestic applications comprise pellet stoves for room heating, or pellet and/or wood chip-fired central heating boilers.

The study researched a number of areas, including the size of the target group, technical and economic issues, fuel supply issues, opinions within the target group and marketing opportunities. The main findings are as follows:

- The target group within the Local Authority areas considered is estimated as being at least 10% of total households. The potential rate of uptake of wood-fired boilers within this group has been estimated as over 4,000 per year. When replacing oil boilers, such an uptake rate would save approximately 19,200 tonnes/year of CO₂.
- Pellet-fired appliances are more appropriate for domestic use due to the larger and more expensive fuel storage equipment required for wood chip. However, wood chip is one of the cheapest fuels available and larger scale community heating systems would benefit from more favorable economies of scale.
- Economies of scale do not currently favour small-scale installations and the higher capital costs are a barrier to interested householders, even with current levels of 'Clear-Skies' grant funding. Although pellets are currently marginally cheaper fuel than oil, capital and running costs for a pellet boiler compared to an equivalent oil system result in payback times of over 10 years at current prices. The situation is not helped by the standard rate of 17.5% VAT on procurement of wood boilers compared to 5% on most fossil fuel equivalents.
- There is a general lack of awareness amongst householders of wood heating technology and of the associated environmental benefits when compared to fossil fuels. However, the level of interest in alternative heating systems was found to be high.

- Significant amounts of waste wood are currently being generated in the areas of study and are potentially available at low or zero cost for conversion to fuel. However, the resource tends to be widely scattered throughout the region and there is a lack of supply and distribution networks for wood chip or pellet fuel, creating a barrier to the establishment of a market for wood-fired heating systems. UK pellet fuel production is still limited to two or three sites resulting in high costs to the householder ordering smaller amounts.

Overall, the study concluded that it is unlikely that any marketing plan relying solely on current market conditions would achieve a significant level of adoption within the target group. There are two main barriers to implementation. The first is the lack of a pellet fuel supply network and distribution, and the second is the higher capital costs to householders compared with existing systems. Both need to be addressed simultaneously in order to kick-start the biomass industry in this sector. The rapid growth of biomass heating in parts of northern Europe has been driven by a combination of carbon taxation on fossil fuels and subsidies on equipment. It is unlikely that significant growth rates in the UK can be achieved without a higher level of government support in this respect.

The vast majority of biomass heating systems installed to date has been limited to 'self-supply' groups. These tend to include large farms or estates with forestry activity where biomass heating systems can be supplied with wood chip produced on-site. The next most promising target group are municipal or public buildings where larger scale systems may benefit the economics and local authority environmental targets may act as incentives. However, this group will still tend to rely on a localised fuel supply network being established.

In view of the above findings, CSE recommend that the following options be considered for implementation:

1. Build on the relationships already established with the villages considered in this study and implement a marketing campaign for the adoption of wood pellet-fired boilers in order to 'seed' the technology within the community and stimulate demand. Additional funding incentives would be used to encourage those households already identified as having older boilers due for replacement, and those found to have an interest in wood heating systems. The campaign would also encourage candidate households to adopt appropriate energy efficiency measures. A guaranteed long-term fuel supply would be negotiated to arrange the bulk purchase and local storage of wood pellets, and participating households monitored for user satisfaction. The resulting cluster of household systems could act as a 'beacon' for the demonstration and promotion of the technology -the first of its kind in the UK.
2. An alternative approach, which aims to stimulate fuel supply networks, may be to build on the results of this study and other initiatives, such as the TreeStation Project, and research the development and funding of a wood-processing depot within a target community. In this case, the business and public sectors would also be targeted in any marketing campaign, as, initially, wood chip production is likely to be the main output, with pellets being delivered from existing production plants and stored in bulk.

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1 SCOPE OF STUDY

The Avon and Somerset Biomass Heating Feasibility Study proposed to investigate the methods required to stimulate the uptake of high efficiency small-scale automatic wood-fired heating systems in the former Avon and Somerset region. The target group was principally households with inefficient coal, LPG and oil-fired heating systems without access to mains gas. The promotion of energy efficiency measures was also addressed alongside that of wood-fired heating systems.

This report presents the findings of the study and covers the following main areas:

- Size of the target group
- Technical and economic issues of small-scale automatic wood-fired heating appliances and wood fuel
- The size of the potential resource of wood residue
- Opinions within the target group
- Recommendations for implementation and projected CO₂ savings

2 BACKGROUND

Wood-fired central heating systems are widely used in the domestic housing sector in northern Europe. For example, 11% of the annual energy consumption in Finland is attributable to renewable biomass (wood) heating. In Austria, the number of new systems increased from less than 1,500 in 1986 to over 40,000 in 2001. The figures are now increasing at a rate of 15-20% per year, the majority of systems being small-scale, pellet-fired appliances.

When wood fuel is derived from managed forests, or is the waste product of wood processing, wood heating is virtually carbon neutral with net carbon dioxide emissions being attributable only to the energy required for transport and processing. With very low SO_x, NO_x and particulate emissions, automatic wood-fired heating is also suitable for use in smokeless zones, subject to appliance and fuel certification. As a low cost fuel it may be appropriate for inclusion as part of a Fuel Poverty Strategy.

The technology is now well-proven and includes central heating boilers and room heaters or stoves for the domestic market. Systems are now very reliable, highly efficient and totally automated (automatic ignition, thermostatic control etc.), and offer a level of convenience equivalent to oil fired heating systems but with substantial environmental and local economic benefits. The share of biomass heating is also increasing steadily as some countries try to reduce their dependence on imported fossil fuels.

Automatic wood-fired heating has the potential to become a major renewable energy industry in the UK, making a substantial positive impact on rural economies. Medium to large-scale modern automatic wood-fired heating offers much lower running costs, since wood chip fuel is one of the cheapest fuels available, although capital equipment costs are higher. The UK has a very large potential resource, a

forestry industry offering an immediate supply of forestry residues and a UK government with ambitious targets for CO₂ reduction aiming to achieve a 20% reduction of CO₂ emissions on 1990 levels by 2010, and 60% by 2050.

In spite of the positive attributes of automatic wood heating in terms of social, economic and environmental benefits over fossil fuels, and the rapid expansion elsewhere in Europe, modern automatic wood heating is still in its infancy within the UK. The number of appliances in England and Wales is currently of the order of 50, if systems whose primary purpose is to reduce wood waste are excluded.

3 PURPOSE OF STUDY

The main aim of the study was to investigate the methods required to stimulate the uptake of high efficiency small-scale automatic wood-fired heating systems, along with any appropriate energy efficiency measures, in the former Avon and Somerset region. In doing so, it was hoped to determine how feasible any subsequent implementation plan would be to achieve a certain level of uptake within the target group. Ultimately, this would serve to displace the use of fossil fuels and contribute to national carbon saving targets.

4 AIMS AND OBJECTIVES FOR PARTNERS

The findings of the project will support the aims and objectives of the key principles and strategies of the lead partner, South Gloucestershire Council. Although the council does not have a carbon reduction strategy specifically, the authority does have a number of key strategies that will result in carbon reduction by virtue of their objectives and scope. These include the HECA Strategy, the fuel poverty strategy "Action for Affordable Warmth", and the Community Strategy.

The council's HECA Strategy seeks an improvement in energy efficiency of housing stock of 25% by 2012, achieving a reduction in energy use and CO₂ emissions as part of this improvement. The joint fuel poverty strategy "Action for Affordable Warmth" seeks to eradicate fuel poverty by 2016 in South Gloucestershire and Gloucestershire and contains specific targets relating to the use of renewable energy resources as a tool to reduce fuel poverty.

South Gloucestershire Council's draft Corporate Service Plan is the proposed delivery mechanism for the local Community Strategy, which sets out priorities for promoting the economic, environmental and social well-being of the area. The Environment is one of eight main themes, and within this the issues of climate change and sustainable development are seen as major challenges.

The council's aim is that the results of the project will contribute towards a variety of objectives within these strategies. The other local authority partners have similar objectives and, if appropriate, would consider replicating all or part of the plan with a view to eventually stimulating regionally co-ordinated development of a wood heating industry.

In addition to the overall aims and objectives of the study, CSE hope that the outcomes will also contribute to the development and delivery of a sub-regional Sustainable Energy Strategy, which is presently being looked at by the nine local authorities served by the Bristol & Somerset Energy Efficiency Advice Centre (EEAC), in conjunction with the Local Authority Support Programme

5 ROLE OF PARTNERS

The role of the partners involved in the study are presented in Table 1.

Partner organisations	Role
South Gloucestershire Council	Active funder and lead partner in project. Attending development meetings and assisting with the development of the feasibility study
Centre for Sustainable Energy (CSE)	Project partner, responsible for development and management of feasibility study.
North Somerset Council, Bath & North East Somerset Council, Taunton Deane Borough Council, Mendip District Council, Sedgemoor District Council, South Somerset District Council.	Active funding partners in project – attending development meetings and assisting with the development of the feasibility study.
West Somerset District Council, Bristol City Council	Other LA partners in project –these LAs have expressed support for the concept.
Renewable Heat and Power Ltd	Project partner, provision of technical & financial advice on wood fired boilers.
South West Wood Fuels Ltd	Project partner, provision of advice on development of supply networks, sourcing fuel.
New Perspectives Ltd.	Project partner, provision of advice on market research activities.

Table 1: Project partners and their role

6 METHODOLOGY

6.1 Assessing size and nature of target group

Although the main target group for this project are owner/occupier households using coal and oil fired boilers in areas off the mains gas network, also considered are those using bulk or bottled LPG, and those using room heaters as their primary heating system.

The main source of data used in estimating the size of the target group was the database held at the Energy Efficiency Advice Centre (EEAC) at CSE in Bristol. Data for the period 2000 to 2002 were analysed. Assuming that the database consists of a representative sample of callers across the region, analysis of these data for households with each type of heating provided an estimate of the percentage of target households in the project areas. The assumption was also made that the large majority of households using oil, solid fuel or LPG as their main fuel would tend to be located in areas without access to mains gas. The database

was divided according to the household's local authority area and cross-tabulations were undertaken to identify the size of particular sub-groups. These were then scaled up using 2001 census data on total number of households in each area.

A reasonable estimation of the proportion of households within a certain area, without access to a mains gas supply, was not possible during the study, as no data was available to CSE. Transco were contacted regarding this, but were only able to supply figures for the south-west region in general. The fact that other Public Gas Transporters (PGTs) are now actively piping gas complicates this further.

However, it is reasonable to assume that those areas with higher numbers of households using fuels other than mains gas for their main heating fuel, as identified in the analysis, are more likely to be off the mains gas network. Specific areas off the gas network were identified using local knowledge and contacting Parish Councils for information. Assessing the likelihood of future mains gas connection for a specific area known to be without mains gas was also addressed and is discussed further in Section 6.4.1.

Further cross-tabulations of the data were conducted to gain information on the extent of energy efficiency measures within certain household groups.

6.2 Assessing technical and financial aspects of wood-fired heating

A brief review of the technical and financial aspects of wood-fired heating was conducted to highlight issues that may act as barriers or incentives to householders. The current market penetration of domestic wood-fired heating appliances was also assessed.

6.3 Identifying local suppliers of wood fuel and supply chains

The main aims of this task were to review the current structure of the wood fuel business and to estimate the wood fuel resource potentially available. For the purposes of this study, it was thought appropriate to focus on specific areas and to investigate the wood fuel resource local to these areas. Two communities were selected for investigation as described in Section 6.4.1.

Initial clues to the existing size of the wood fuel business in the project areas were gleaned by inspection of the "Firewood" section of the local *Yellow Pages* directory, and by looking in local or regional papers classified advertising sections which in winter often carry advertisements for firewood. By telephoning these suppliers, and explaining the project and its needs, information was collated on the numbers of customers to whom they provide firewood and their sources of supply. Forestry organisations, timber suppliers, joinery workshops, tree surgeons, wood stove suppliers and waste disposal authorities were also consulted in the course of the study.

Using a simple telephone questionnaire, a database of waste-wood producers was established from which estimates were made on the potential wood fuel resource.

6.4 Assessing potential market for wood-fired appliances

In order to assess the potential take-up level of new wood-fired appliances, market research was conducted on selected areas. Initially, current attitudes and beliefs about wood-fired heating were assessed among households in the study areas. A quantitative survey was then conducted in the same areas to back this up and help identify the information, advice and incentives that may be required to overcome inertia among potential customers. The methods used are described as follows:

6.4.1 Area selection for market research

Two separate areas were first selected for market research purposes. The criteria for selection included having no access to the main gas network and populations of around 1000 or more. Each of the two areas chosen consisted of two adjacent villages within the same county ward, making a total of four villages: Iron Acton and Rangeworthy in South Gloucestershire, and Publow and Pensford in Bath and North East Somerset.

Enquiries were made to Transco as to the likelihood of future connection to the gas network. A full evaluation can be undertaken by Transco via an 'in-fill' enquiry request from the community under consideration, which requires assessing the level of interest from all households considered. A cost per metre of extending the gas network from the nearest suitable connection point is used as a starting point. The likely cost per householder for mains gas connection is then obtained and is dependant on 60% of the households expressing an interest, and 40% of these signing up for connection. The community at Publow/Pensford had made a similar enquiry in 1998 and were informed that each household would be required to pay around £1100 for connection, hence no work was undertaken.

The local parish councils were contacted about this project and publicity was gained with brief articles being published in the parish newsletters.

6.4.2 Pilot Survey

A pilot survey was then conducted on a small random selection of households in the chosen villages. This consisted of door to door enquiries and brief interviews with ten householders. The topics discussed included the following:

- Energy efficiency measures recently installed or envisaged in the near future
- Opinions of the household's current heating system & fuel supply/storage issues
- Opinions on wood-fired heating

The main aim of the survey was to highlight any issues that may not have been previously considered in the study and to gain any local knowledge of existing fuel wood supply and use. The findings were then used to help design a questionnaire with which to target all households within the four villages.

6.4.3 Quantitative questionnaire

A quantitative questionnaire was produced to target all households in the selected villages, using findings of the various project tasks undertaken up to this point. The main aim of the questionnaire was to assess the level of knowledge and interest amongst householders potentially suited for switching to wood-fired heating and the extent of existing energy efficiency measures. The questionnaire contained 26 questions in total, made up of a selection of yes/no, multi-choice and open-ended types. Distribution was achieved via a combination of mail outs and letter-box drops and an incentive was provided in the form of a prize draw with five solar-powered radios to be won. The questionnaire is presented in Appendix C.

Analysis of returned questionnaires was undertaken and included a cross-tabulation of appropriate question combinations.

6.5 Identify referral networks & marketing opportunities

Research was undertaken on the ways in which any future marketing or awareness raising campaign regarding wood-fired heating could be implemented on a localised basis.

6.6 Identify potential funding sources

A comprehensive list of potential funding sources for any future implementation projects was compiled.

7 RESULTS

7.1 Technical, economical and environmental issues

7.1.1 Fuel types

Modern automatic systems are generally designed to burn either wood chips or pellets. Wood chips are produced from 'green' wood waste such as that from forestry work or other arboricultural operations. They can be easily produced at source with large quantities currently being used for composting or horticultural bedding material. Wood pellets are manufactured from recycled wood waste, such as sawdust or recycled pallets, and are designed to be compact and easy to burn.

There are pros and cons of using both fuel types and automatic wood-fired appliances are generally designed to use one or the other. The energy 'density' of wood depends largely on its moisture content and this can vary considerably with wood chip, depending on its source and period of storage. Wood pellets are dried during manufacture and offer consistent combustion properties. When comparing energy content on a volume for volume basis, the compact form and lower moisture content of pellets allow for a smaller volume of storage space than is required for wood chip, and hence less frequent user intervention in re-fuelling. For example, a domestic-size boiler running on dry wood chip would require a 1m³ hopper in order to provide up to 24 hrs of continuous running¹. By contrast, a similar sized hopper on a pellet-fired boiler would supply fuel for around four days continuous running before a top-up is required.

Pellets, however, are more expensive than wood chip and their production in the UK is limited to a small number of sites which further hinders economics in distribution.

7.1.2 Types of small-scale systems

Automatic wood-fired heating systems now utilise an established and mature technology that encompasses reliable, highly efficient and fully automated systems.

There are two main types of small-scale automatic wood-fired heating systems currently available:

- a) stoves (room-heaters) burning wood pellets for space heating
- b) larger-scale boilers burning pellets or chips for space and water heating.

a) Pellet stoves

Automatic pellet stoves typically range from 6 to 12 kW in heat output, with efficiencies of 80-90%, and are ideally suited to heating a single large room. The

¹ British Biogen (2001) Heating with Wood Chip. www.britishbiogen.co.uk/bioenergy/heating/heatwchip.

systems are stand-alone, come in a range of styles and produce an attractive flame. Features generally include automatic ignition, combustion and convection fans and a large integral hopper built into the back of the stove, which can hold sufficient pellets for between 20 and 40 hours operation. The high combustion efficiencies result in very little ash being produced and the ash pan will require emptying around once per month during the heating season. Heat output is controlled by a thermostat, which regulates the rate at which pellets are fed into the combustion chamber.

During operation, the combustion and convection fans will emit a certain amount of noise. However, some stoves offer the option of fitting the combustion fan away from the stove (on an outside wall within the flue) and the ability to switch off the convection fan and use natural convection at low output to reduce the noise even further.

Flue runs will depend on the location of the stove. If positioned against an external wall and a chimney is not available, the flue will be installed through the wall. Alternatively, the flue can be routed up through the ceiling to the roof. Part J Building Regulation is relevant and includes the requirement for the flue opening to be positioned at a certain height.

To increase the market penetration at the domestic level a number of pellet stove manufacturers are developing a stove with a separate back boiler system to enable the stove to heat a number of rooms using radiators and to heat hot water.

b) Chip or pellet boilers

Like stoves, wood chip and wood pellet boilers are now highly efficient, reliable and sophisticated machines. Sizes will typically range from 13 kW to 23 kW for domestic central heating applications. They offer a convenience approaching that of fossil fuel enabling timers and thermostats to be used in an identical way to fossil fuel systems. They often have automatic ignition and features such as "lambda-control" whereby the system monitors the excess oxygen within the flue emissions and adjusts the secondary air in real time to enable optimum air fuel ratio to be maintained constantly and hence achieve efficiencies around 90%.

In addition, many systems in Europe have "capacity control" whereby the machines can adjust fuel input and primary and secondary air to reduce the capacity of the boiler down to say 20% of its full output to match the load. This results in an increased efficiency and performance over systems that simply switch between "on" and "slumber" to meet the load requirement.

Wood chip or pellets are held in a separate or integral hopper and are automatically fed to the boiler using an auger screw. Maintenance requirements will typically consist of emptying the ash pan once every three months and cleaning the burner once a year.

Generally, the use of a chimney will require a flue installation, although this will depend on its condition and cross-sectional area.

In some countries, conversion kits are available to convert certain types of fossil fuel boilers to run on wood pellet fuel. However, this will only apply to a very limited range of boilers and is not thought to be relevant to the UK domestic market at this time.

7.1.3 Economic analysis

Capital costs together with fuel and operational costs of biomass systems need to be compared to equivalent fossil fuel systems in order to assess overall economic attractiveness to the domestic market.

Automatic wood-fired boilers currently available on the UK market can be split into two types -those with integral hoppers and those with a large fuel store. Pellet stoves, however, are normally only available with integral hopper. In general, boilers with an integral hopper or “magazine” within the boiler system are considerably less expensive. However, the downside of this is that the user must refill the magazine at frequent intervals (perhaps every few days).

Most systems available on the UK market have an option of the boiler/combustion unit being linked to a separate large fuel store which means that fuel delivery to the hopper can be very infrequent (perhaps 2 or 3 times per year). Because pellets are much easier to transport than chips, and have a higher energy density, the cost of storage systems for pellets is much cheaper than corresponding wood chip systems since smaller volumes are required and the extraction machinery is considerably less complex and of much lighter construction.

The following equipment prices (excluding installation costs, flue system and VAT) for a particular make of boiler (Primdal and Haugesen) are given below as an example.

a) P&H 23kW Wood Pellet system with 600 litre magazine	£3,950
b) P&H 23kW Wood chip system with 600 litre magazine	£4,201
c) P&H 23kW Pellet system with feeder system for large store	£5,344
d) P&H 23kW Wood chip system with feeder system for large store	£8,766

Table 2 shows the simple payback periods for the four automatic wood-fired boilers compared to an oil-fired boiler at two different prices for heating oil¹, with and without a ‘Clear-Skies’ grant of £50/kW. The payback periods shown are those necessary to recoup the extra cost of installing a wood-fired system over and above that of an equivalent oil-fired system, via cheaper annual running costs. Appendix F summaries the fuel prices assumed below.

The following assumptions are made in the analysis:

- Heat load per year (space and water heating) is 25,000kWh².
- All wood-fired systems assumed at 90% efficiency
- Oil system assumed at 85% efficiency
- Cost of oil system (including store) is £2,500

¹ Price of oil around 20p/litre Apr 03 see: www.jwilloughby.fsbusiness.co.uk

² Represents a large detached house with low levels of insulation

- Cost of bulk delivery of pellets is £80/tonne¹ + 5% VAT
- Cost of wood chips is £40/tonne + 5% VAT @25% moisture content delivered
- Grant available= £1,150 based on £50/kW available under “Clear Skies” initiative
- The cost of installation is £500 for the oil system, £1000 for all automatic wood systems except system 'd' (large chip store) where it is assumed an extra £1,000 is required for fuel store construction.

System	Fuel	Equipment	Installation	Total	Annual Fuel Bill	No Grant		Grant		Grant as a %
						20p/litre	30p/litre	20p/litre	30p/litre	
						payback	payback	Payback	payback	
a	pellet	£3,950	£1,000	£4,950	£497	22.1	5.9	11.7	3.1	23%
b	chip	£4,201	£1,000	£5,201	£313	9.1	4.5	5.3	2.6	22%
c	pellet	£5,344	£1,000	£6,344	£497	34.6	9.3	24.3	6.5	18%
d	chip	£8,766	£2,000	£10,766	£313	28.0	13.8	24.1	11.9	11%
Oil @ 20p/litre	oil	£2,000	£500	£2,500	£608	N/A	N/A	N/A	N/A	N/A
Oil @ 30p/litre	oil	£2,000	£500	£2,500	£912	N/A	N/A	N/A	N/A	N/A

Table 2: Comparison of payback periods for domestic central heating systems (capital cost VAT and flue costs not incl.)

From the above analysis, it is evident that, on purely economic terms, the payback period for all systems, with oil at 20p/litre and without a grant, is too long to be generally attractive to domestic customers. On systems with a large fuel store (giving high user-convenience and low intervention levels), the grant rate is low (less than 20%) and is not close to being economic at the lower oil price. The situation improves with oil at 30p/litre but payback period for the large store chip system remains above ten years.

It should be noted that VAT is not included in capital costs for the above analysis. Currently VAT is fixed at 17.5% on wood-fired boilers, whereas most fossil fuel appliances for domestic procurement benefit from a discounted rate of 5%. This would have the effect of further increasing the capital costs and payback periods of wood-fired systems when compared to equivalent fossil-fuel systems.

The annual heat load used in the above example is typical of a large detached house with poor insulation characteristics. Clearly this figure will drop considerably for smaller, better insulated dwellings or new-build energy-efficient houses, and may decrease by up to 70% for 'low-energy' dwellings. The capacity of the heating system could then be downsized accordingly, as would the annual fuel requirement. However, the decrease in capital costs for smaller capacity boilers would be relatively small and payback periods would remain long.

¹ This price is not available yet in the UK, but from discussions with developers of pellet mills is likely to be within 6 –12 months.

The costs of pellet stoves currently range from about £1400 to £2500, with flue system and installation perhaps adding £1000 to the total. Their use as top-up or 'comfort' space heating would tend to replace conventional solid-fuel fires or stoves, portable or fixed gas, oil and electric fires, and possibly electric storage heaters. Payback periods for pellets stoves compared to most of these appliances are likely to be unattractive to householders due to the higher capital costs.

The economics of using a wood-fired boiler for summer water heating will depend on the hot water demand and hot water storage/boiler system type, as some systems are better running on part-load for longer periods of time than others. Under certain circumstances it may be more appropriate to use supplementary options such as electric immersion heating or point-of-use water heaters. Many target households would already have these in place.

7.1.4 Environmental issues

The potential CO₂ savings from using sustainably-produced wood fuel will depend on the type of fuel that is being displaced. According to published figures¹, the amount of CO₂ released per kWh of heating oil is approximately 0.25kg/kWh. The *net* CO₂ emissions from wood fuel is officially zero, assuming that wood is obtained from sustainably managed woodlands where new tree growth soaks up the carbon released from wood combustion. However, transporting the fuel will result in some emissions, the magnitude of which will depend on the fuel supply network in place.

A 'typical' household with central heating will have an energy consumption of around 23,000 kWh/yr, of which 84% is used for space and water heating². Conversion from oil to wood fuel in this case would annually displace around 2,000 litres of oil, and would result in CO₂ savings of around 4.8 tonnes per year. In the example given in Section 7.1.3, where wood chip or wood pellet fuel directly replaces an oil consumption of around 3,000 litres per year, the total annual CO₂ savings would be around 7.4 tonnes of CO₂³. If coal were being replaced the savings would be approximately 25% higher, while for LPG the savings would be approximately 25% lower.

Although there is virtually no visible smoke from automatic wood-fired appliances due to their high combustion efficiency, the use of all wood-burning appliances is limited by the Clean Air Act 1956. This states that it is illegal to burn non-exempt fuel or use non-exempt appliances in designated smokeless zones within the UK. Although to date, pellet fuel has not been given such exemption and no exempted pellet stoves are currently available, this situation is likely to change in the near future. In the short term, exclusion from smokeless zones should not act as a barrier to implementation as investigated in this study. This is due to target households being off the mains gas network and hence usually situated in rural areas outside of smokeless zones.

¹ Energy Efficiency Commitment 2001 (see www.ofgem.gov.uk)

² GPG301: Domestic heating & hot water (2002). Housing Energy Efficiency Best Practice Programme

³ Based on 0.25kg CO₂/kWh for heating oil (source: Energy Efficiency Commitment 2002)

7.2 Target group

The relevant results of the analysis on the EEAC database are presented below. Table 3 lists the household groups considered and is based on the question format of the standard Home Energy Check questionnaire used by the EEAC. Table 4 presents the results of the analysis and includes extrapolated figures using Census data :

Household Group	Criteria for Group
A	Owner/occupiers AND using oil/solid fuel/bottled gas/LPG as main fuel
B	Owner/occupiers using main fuel other than mains gas AND regularly using a separate solid-fuelled fire
C	Owner/occupiers AND using boilers+radiators as main heating system AND using oil/solid fuel/bottled gas/LPG as main fuel
D	Owner/occupiers AND using room heaters/fires as main heating system AND using oil/solid fuel/bottled gas/LPG as main fuel

Table 3: Household groups

	Total No Households ¹	Group A		Group B		Group C		Group D		Data sample size
		No.	%	No.	%	No.	%	No.	%	
N.Somerset	79985	3279	4.1	1260	1.6	2799	3.5	320	0.4	1333
Sedgemoor	44432	8175	18.4	1120	2.5	7198	16.2	400	0.9	1150
BaNES	71115	6045	8.5	1444	2.0	5120	7.2	640	0.9	985
S.Somerset	63769	11415	17.9	441	0.7	9757	15.3	1530	2.4	1657
W.Somerset	15625	2969	19	724	4.6	2313	14.8	313	2	453
Taunton D.	43880	6231	14.2	1229	2.8	5266	12	483	1.1	1178
Mendip	42881	7161	16.7	805	1.9	5832	13.6	643	1.5	3570
S.Glos	99038	3862	3.9	891	0.9	3169	3.2	396	0.4	2556
Totals (or averages for %)	460725	49138	10.7	7915	1.7	41454	9	4725	1	12,882

Table 4: Results of EEAC database analysis extrapolated using Census data

¹ Taken from 2001 Census data

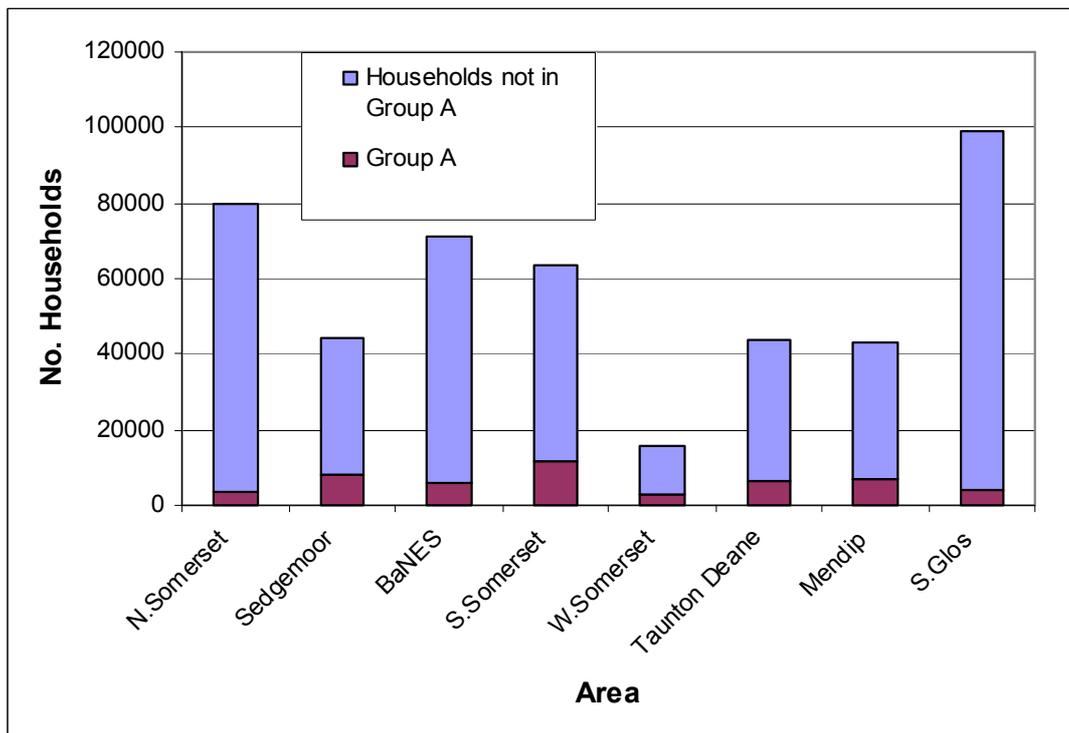


Figure 1: Results of EEAC database analysis showing estimated proportion of households in study areas within Group A (owner-occupiers using oil/LPG/solid fuel/bottled gas as a main fuel)

In order to estimate the size of the target group, two assumptions have been made:

1. The EEAC database is considered a representative selection of households across the area
2. Group A reflects the proportion of owner-occupier households using oil, LPG, solid fuel or bottled gas as a primary fuel, and this group will tend to be located in areas without access to mains gas

Central heating systems

On a national basis, there are approximately 1,021,000 oil or LPG-fired domestic central heating systems in the UK.¹ Of these, around 10% are replaced each year, most of which would be suitable for replacement with pellet-fired systems. If the same statistic is applied to Group C (owner-occupiers using boilers/radiators AND oil or LPG or solid fuel or bottled gas as main fuel), the potential market per year for replacement systems would be 4,145 or around 0.9% of total households in the local authority areas considered.

¹ Low Carbon Heating with Wood Pellet Fuel –report by XCO2 conisbee Ltd.

Further indications as to potential take-up rates are discussed in Section 7.6.

Stoves

The potential market for pellet stoves is more difficult to estimate as the groups will overlap and it is not clear how frequently they are replaced. Group B households are the obvious candidates for pellets stoves and number 7,915 (1.7%) in total. Applying a 10% annual replacement rate, a total of 792 (0.2%) households/year are potential targets in the area considered. However, this number is likely to be higher as the figures for Group B do not include users of secondary heating fuelled by LPG/bottled gas or electricity. Additionally, a proportion of households using mains gas may currently use room heaters and may consider renewing them with pellet stoves when there is cause for replacement.

Energy Efficiency Measures

In order to gain an understanding of the level of energy efficiency of households in areas without access to mains gas, South Gloucestershire was profiled using the EEAC data. A sub-dataset of those households using oil or solid fuel as their main fuel type was analysed for the extent of basic energy efficient measures. Table 5 presents the results.

Proportion of 'oil or solid fuel' households with...					
100mm or less loft insulation ¹ [%]	No double glazing [%]	No draught-proofing [%]	Age of boiler 15 yrs or over [%]	Uninsulated cavity walls [%]	No CFLs ² [%]
60	21	33	40	12	42

Table 5: Proportion of 'oil or solid fuel' households in South Gloucestershire lacking certain energy efficiency measures

The results of the questionnaire presented in Appendix C revealed that approximately 65% of cavity walls were not insulated, 40% of lofts had 150mm or less of loft insulation and 65% of households were not draught-proofed. This suggests that there is a high likelihood of any one household having potential to incorporate some form of basic energy efficiency measure in addition to a wood-fired heating system.

¹ Current recommendation is 250mm of loft insulation

² CFL = Compact Fluorescent Light

7.3 Market penetration

7.3.1 Wood pellet demand

Wood pellet fuel is now a global commodity with many tens of thousands of tonnes being shipped annually. The current world production of wood pellets is approximately 2.5 million tonnes per year, a level that is increasing by about 20% a year. Wood pellet boilers and stand alone pellet stoves are being installed across Europe with many hundreds of thousands of boilers currently operational. For example approximately 8,000 new pellet boilers were installed in Austria alone last year. The main driver of this expansion was the introduction of domestic carbon taxes and grants for low carbon fuels.

In addition to small, medium and large scale automatic wood heating systems there are other substantial markets for wood pellets. These includes co-firing in large coal-fired power stations and animal bedding, in particular wood pellet cat litter. Cat litter pellets hold approximately 14% of the UK cat litter market and is increasing its market share year on year. A further potential market for UK pellet production is that of export. There is a shortage of reasonably priced wood pellets and buyers from Denmark, Sweden and other countries are keen to obtain new supplies from the UK¹. In the winter of 2002 there was a large shortfall in supply in the pellet market in Scandinavia, pushing up prices.

7.3.2 UK market

The pellet stove market is supplied by bagged 6mm fuel in 10, 15 or 20kg bags. Based on discussions with suppliers, the retail price is likely to stabilise somewhere between £2 – £3 per 15kg bag, which equates to £130-200 per tonne. South West Wood Fuels Ltd. are currently offering pellets at £2.75 per 15 kg bag plus 5% VAT and transport costs. For a 1 tonne pallet, the transport cost will be £30 for the local area (Devon, Somerset and Cornwall), and £40 elsewhere in South West. A £40 transport fee would add around 60p per 15kg bag. Transport fees would be waived for a bulk order of 25 pallets within the south west. However, all this will change shortly when Devon and Lincolnshire pellet mills come on line. Loose bulk deliveries for pellet boilers are likely to cost around £80/tonne and use a specially designed delivery truck to 'blow' loose pellets into a hopper using air.

Although the domestic sector is the major market for pellet stoves in North America and Northern Europe, the market potential for pellet stoves in a domestic situation is unclear at this point. In terms of numbers of operational units, the most prevalent are the Envirofire stoves, which are imported from Canada by Bio-Energy Devices Ltd, based in South Wales. The majority of operational stoves (estimated to be between 60–80 in England and Wales) are situated in offices, workshops, public buildings, etc. rather than in households.

¹ Personal communications between Robin Cotton, Renewable Heat & Power Ltd. and a number of potential wood pellet buyers from Europe

There are currently a number of systems designed for both wood pellet and wood chip fuel now available on the UK market. The majority of these systems are from mainland Europe although there is one manufacturer of larger scale biomass heating systems (Talbotts Ltd who specialise in systems above 50kW) and one UK manufacturer launching a range of small scale pellet boilers this summer (Cornwell Heat Ltd producing the "Ecovatic" range).

7.4 Fuel resource

The nature of wood fuel resource is fairly complex in terms of the differing sources, quality and forms that these residues take. Broadly, the residues can be split into two categories, namely:

1. Green wood residues from arboricultural sources or woodland thinnings such as that from tree surgeons or forestry operations.
2. Recycled untreated wood waste from sources such as joineries, furniture workshops, waste management contractors, etc.

The two forms of wood fuel that are suitable for the automatic wood burners considered in this study are wood chips and wood pellets. Although logs are widely used in the domestic sector in more traditional log burners, these appliances tend to be less efficient, less controllable and less easy to operate. The current wood fuel business in the two communities considered largely consists of informal arrangements between householders and other local landowners with logs for sale by the bag.

7.4.1 Wood Pellets

At time of writing, there are only two pellet mills operational within the UK. A 3 tonne/hour machine run by Welsh Biofuels Ltd is operational in Bridgend, South Wales and a similar size pellet mill is operational in Durham supplying both bulk and bagged pellet fuel both locally and nationally. The fuel supply infrastructure is therefore very limited, with a single pellet tanker available for bulk deliveries at the Bridgend plant.

There are, however, a number of initiatives throughout the UK to develop pellet production facilities. A large scale 5 tonne per hour mill is currently under construction in Lincolnshire which is due to be commissioned later in 2003. A small plant is currently under development in Devon which will produce about 6,000 tonnes per year from a variety of raw materials. There are other initiatives in Nottingham, Northamptonshire and Powys at various stages of development.

Raw materials for pellet manufacture may come from a variety of sources including sawdust, recycled pallets or specially grown energy crops. Clearly, the size of the pellet resource will be dependent on the number of manufacturing facilities coming on-line, and on raw material availability and demand. The raw material resource for each pellet plant is generally sourced on a local basis and developers have so far had little trouble in identifying a potential resource. A previous study¹ in 2001 has

¹ 'Introducing Wood Pellet Fuel to the UK' (ETSU B/U1/00623/REP) 2001

identified over 10,000 tonnes/year of clean wood waste (not including forestry residues) within Devon and Somerset, which would be more than sufficient to set up a 5000 tonne/year pellet production facility. The main problem, however, appears to be the widespread scatter of the resource and the necessity of sourcing a single concentration of potential feedstock that justifies the investment required.

The development of secure supplies of locally made price-competitive pellets without an established market is another major barrier. Research has been undertaken on utilising existing animal feed pellet mills for wood pellet production, some of which tend to operate during the summer only.

7.4.2 Wood Chip

Wood chip supply is very different in nature to pellets. Whereas pellet mills tend to be large production facilities, wood chip can be supplied from a number of smaller sources such as forestry owners, farmers, sawmill owners and from the waste sector. Wood chip fuel is local by nature and therefore local suppliers are needed in an area to enable clusters of wood chip installations to be established.

There are two initiatives in the UK specifically designed to establish wood fuel supplies; South West Wood Fuels Ltd, a not-for profit cooperative based in Devon and Somerset which currently has 43 members, many of which supply wood chip across the region. On a national basis, the Logpile¹ project by the National Energy Foundation is establishing a national database on wood chip (and pellet and log) supplies in England and Wales. The Marches Woodland Initiative or 'Heartwoods' has also been established in the West Midlands and aims to promote all sustainable aspects of forestry.

Tables 6 and 7 present a summary of the results of a survey conducted on the potential waste wood resource in the areas surrounding the villages considered in Section 7.6. A representative sample of potential suppliers within an approximate 10 mile radius were assessed using a simple telephone questionnaire and a database was produced from which estimates were made on the potential waste wood resource. Full details are presented in Appendix B.

¹ www.logpile.co.uk

Tree Surgeons	Estimated Annual Tonnes of Green Waste
All Tree Services	720
Blagdon Tree Services	336
Arboricultural Services	1680
M Williams	30
Subtotal	2,766
Joiners	Estimated Annual Tonnes of Dry Waste
Windsor Joinery	50
Belvedere Manufacturing Co	50
Swanglen Furniture Ltd	195
Good Wood Trading Co Ltd	60
Subtotal	355
Total	3,121

Table 6: Summary of wood waste resource around Publow and Pensford

Tree Surgeons	Estimated Annual Tonnes of Green Waste
Bitton Tree Care	52
Cambridge Logging Company	500-1000m ³
Gazzard Tree Works	104
Heritage Tree Services	520
Instant Tree Care	312
Modern Arboreal Consultancy	104
Subtotal	1,092
Joiners	Estimated Annual Tonnes of Dry Waste
Hendy Joiners	4
G Curtis Woodworks	1
Subtotal	5
Total	1,097

Table 7: Summary of wood waste resource around Iron Acton and Rangeworthy

Within the two areas of study, an annual amount of approximately 3,100 and 1,097 tonnes respectively of waste wood has been identified. These figures are likely to be higher as the survey was not exhaustive and not all companies responded with information. Some of these companies have indicated that they would deliver wood to a local site at no charge, as they currently pay for disposal.

The four joinery companies listed in Table 6 generate a total of 355 tonnes per year. Assuming all the waste is appropriate for pellet manufacture, this amount would annually supply around 90 households using pellet boilers as central heating systems¹. The four tree surgeons listed together annually produce around 2,766 tonnes of green waste. Assuming that half this weight can be converted to chips (at 25% moisture), there is potential to supply around 280 domestic-sized wood chip

¹ Based on annual energy consumption 19,320 kWh (see Section 7.1.4)

boilers¹. Although wood chips are currently less appropriate to domestic applications due to practicality and cost of storage, this serves as an example to the potential resource available.

A similar survey undertaken by CSE within the Bristol area identified approximately 270 tonnes of joinery waste and 2,545 tonnes of green waste produced per year. Other potential local sources may include local landowners responsible for woodland areas, the Forest of Avon, who are currently assessing quantities of arboricultural waste within their managed woodlands, woodlands managed by the Forestry Commission, civic amenity sites and waste management contractors.

7.5 Local Supply

Two main options exist for arranging a local pellet or chip supply for the domestic market:

1. Wood-Processing Depot

A 'TreeStation Project' initiative has been set up by the BioRegional Development Group with a pilot scheme in operation in Croydon. A study was undertaken to investigate the feasibility of setting up a network of wood processing depots in the UK². A TreeStation is defined as:

- A collection point for local timber arising as a result of either tree surgery waste or of local woodland management
- A processing point to add value to the local timber
- A sales outlet for the processed products, this could also include a woodland management system

One of the main findings of the study was that, under certain conditions, a TreeStation would be feasible. Although this is likely to require initial grant funding, the report suggests that an operational profit could be made. The station could act in part as a pellet storage facility. Depending on the type and amount of available local wood resource, and when pellet demand or available funding may enable it, a pellet mill could also be incorporated, along with wood chipping equipment and drying/storage facilities.

2. Local Supply Network

The other option is to arrange a local pellet supply distribution network using local distributors such as stove suppliers, garages, DIY, etc., although the subsequent mark up would increase the cost of pellets.

Option 2 would clearly require an initial market demand for pellets and current demand among householders is likely to be too small, and too scattered, to rely on the establishment of a local distribution network. Option 1, however, could rely on grants and other commercial wood-related activities to become established before

¹ Based on annual energy consumption 19,320 kWh (see Section 7.1.4)

² The TreeStation Project, Bioregional Development Group, 2001. See www.bioregional.com

the demand for pellets increases. This could include a wood chip supply to larger scale biomass boilers, not necessarily in the domestic sector.

At present, it is not economically feasible for a householder to order a small delivery of pellets from existing suppliers.

7.6 Market Research

7.6.1 Domestic Sector

The results of the pilot survey as described in Section 6.4.2 were taken into account when designing the quantitative questionnaire. The main issues resulting from the survey were as follows:

- A general lack of knowledge of modern automatic wood-fired heating systems and fuel types.
- A lack of awareness of the environmental benefits of wood heating relative to fossil fuel systems.
- The difficulty in assessing a genuine 'willingness to pay' from questionnaires – further information is usually requested.
- A level of caution in expensive home improvements due to the likelihood of moving house.

The follow-up quantitative questionnaire, presented in Appendix C, was sent out to approximately 1000 households and resulted in a 15% return rate. A summary of responses to each question is also presented in Appendix C. The main points of relevance resulting from the cross-tabulation analysis are as follows:

- 86% of properties surveyed were pre-1976 and many lacked basic energy efficiency measures such as cavity wall insulation, over 150mm loft insulation and draught-proofing.
- The three most popular factors, in order of importance, that would influence the decision to switch to wood fuel (Q24) were: 1) How well it heats your home; 2) Fuel cost and 3) Value for money. The results were the same for each household income category.
- All households using room heaters or stoves as their main heating system regarded their '**cleanliness**' as '**average**' or '**poor**'. 56% of all respondents thought that '**cleanliness**' with using wood fuel was '**average**' or '**poor**'
- 72% of respondents had not heard of wood pellet fuel.
- 34% of households using oil as their main fuel thought that its use was '**good**' or '**excellent**' in terms of environmental friendliness. 22% did not know.
- 87% of households had secondary heating systems comprising room heaters or solid fuel fires.
- 84% of households had a chimney in working order.

- 83% of households had a space suitable for solid fuel storage.
- 91% of households using oil as their main heating fuel thought it '**average**', '**good**' or '**excellent**' in terms of value for money.
- The two most popular responses given by households that would consider alternative fuels if their heating system needed replacing, were '**cheaper fuel/economic reasons**' and '**environmental reasons**'.
- 71% of respondents may consider paying more for a wood-fired heating system than a fossil fuel equivalent.
- 67% of householders surveyed have recently considered changing their heating system or adding extra appliances.
- 21% of households had central heating boilers more than 15 years old.
- 86% of households using room heaters or stoves as their main heating system had appliances over ten years old.
- 7% of respondents had recently considered changing their heating system as a replacement boiler was required.
- 8% of respondents had recently considered changing their heating system for '**better control of heat levels**' or because '**current system is inefficient**'.

7.6.2 Business Sector

The large majority of tree surgeons contacted for the survey in Section 7.5 do not operate from dedicated business premises but instead tend to operate a mobile service from home. Therefore, these companies were not thought suited as potential 'self-supply' users of wood chip for heating.

7.7 Marketing opportunities

A number of previous studies¹ have suggested various national marketing initiatives designed to stimulate the wood fuel industry. The main challenge is the mutual reliance of supply on demand and vice versa.

This section outlines the elements of a local marketing campaign, the aim of which would be to 'seed' the technology and raise awareness among target communities, i.e. to stimulate demand. The campaign would not only be directed towards the domestic sector but would also address the public and business sectors. A variety of routes are available to promote wood-fired heating systems to villages such as those addressed in this study and are described below.

¹ 'The TreeStation Project', BioRegional Development Group, 2001; and 'Introducing Wood Pellet Fuel to the UK' (ETSU B/U1/00623/REP) 2001

7.7.1 Target audience

The target audiences for wood-fired heating can potentially include:

- Householders
- Community groups – e.g. wildlife groups, voluntary groups, parish groups, housing associations, tenants groups
- public buildings – e.g. schools, churches, community halls
- locally-based SMEs (small-scale commercial sites), including farms
- heating installers operating in the areas
- local wood suppliers

The target group thought most likely to respond first include:

- those who are already 'green'-inclined
- those whose current heating system needs replacement
- those currently spending a lot on the upkeep and running of their heating system
- those able bodied enough to handle the maintenance of a wood pellet-burning appliance
- those that plan to remain in their property for the foreseeable future
- those affluent enough to afford the higher installation costs.

Very few are presumed to have any particular interest in or knowledge about renewable forms of heating or wood pellet-burning appliances.

7.7.2 Objectives

The aims of promoting wood-fired heating to these communities are:

- To introduce and explain the technology and the different systems available
- To make clear the appropriateness of the technology in locations that are off the gas network or for other reasons using fuels other than gas to heat their homes
- To help remove barriers to the uptake of the technology by explaining the practical benefits and convenience of the technology
- To raise awareness of the environmental benefits of wood as a fuel
- To raise awareness of the benefits of locally-sourced fuel for the local economy

7.7.3 Activities

A plan of action to achieve these objectives is suggested as follows:

1. Local events

CSE believe that by far the most effective way to achieve the objectives would be through personal face-to-face contact. This could be achieved by ensuring a presence at key community events, such as village festivals, school open days, business events, etc. and by staging special events such as 'Introducing Wood Fuel' information evenings in local venues.

Information displays and demonstrations would allow householders to see the pellet-burning equipment up close, and experts could be on hand to talk about the benefits (environmental and practical), the implications of installing and running the systems, and the cost, and answer questions. Events staged by CSE could include a presentation by a local user of a wood-fired appliance.

2. Media

A proportion of the target audience for the scheme could be reached through news articles, features and advertising in the local and regional press. One option may be to target the free newspapers and parish newsletters that are delivered to every letterbox in the area. There is also a possibility of coverage on local radio and on local websites. Appendix D presents a list of local media specific to the villages under study.

Key to the success of any media coverage will be identifying a local 'case study' site where the technology has been successfully installed, where measurable benefits can be drawn out, along with quotes from the owner of the site. It would be ideal to have a case study from both a household and a commercial site.

3. Promotional literature

These could include specially produced leaflets, posters and permanent displays. The leaflet could be inserted into local newsletters and newspapers, given away at local business premises (particularly stove shops, hardware stores, wood product shops, farm stores), at local events, at the information evenings, in mobile libraries, etc. or sent out in response to telephone requests. If costs allowed then literature could be mailed out direct to residents.

If appropriate sites are identified, a permanent information display could be arranged.

4. Joined-up Promotion

This scheme could potentially be promoted alongside other local advice services run by CSE. CSE currently manages an energy advice service for local SMEs, an Energy Efficiency Advice Centre and a Renewable Energy Advice Service, all of which operate in B&NES and South Gloucestershire. These services include freephone advice lines, home and site visits and attendance at events.

In addition, the scheme could be promoted as part of CSE's ongoing general publicity activities such as the quarterly newsletter, enews and website.

5. Other local organisations

It will be important to network with a range of local organisations/individuals including relevant local authority officers (LA21, HECA, energy managers) and parish councils.

6. Other activities

Potentially, if sizeable groups of residents are found to be interested in the scheme, discounts could be negotiated for group orders. This could mean that individuals will actively promote the scheme themselves in order to create a large enough group to gain a discount. Once boilers are purchased the group could also join together to bulk-purchase pellets.

7.8 Sources of funding

Appendix E presents a list of potential funding sources or financial incentive schemes that could be relevant to biomass heating projects.

8 KEY ISSUES AND LESSONS LEARNT

In researching this study, the following barriers to the dissemination of automatic wood-fired heating systems within the domestic sector have been identified:

a) Economies of scale

There is a general trend for the cost of automatic biomass heating systems to increase substantially per installed kW for smaller systems. For example a 15kW pellet boiler may cost say £6,000 (i.e. £400/kW) whereas a 150kW pellet boiler may cost say £22,500 (i.e. £150/kW). In the latter case the system has ten times the output (and hence will generally displace ten times the amount of fossil fuel) although it is less than four times the price.

b) Sensitivity to cost

Within the commercial and public sectors, decisions on such issues as choice of heating system will tend to be based on a large number of factors, including the relative capital cost and running cost of the various options. This data will typically be used to calculate an approximate payback period, of which 5-10 years may usually be considered attractive on boiler equipment with a lifetime of over 20 years.

Results of the analysis for the two pellet boiler options in Section 7.1.3 indicate that, even with the currently available Clear-Skies grants, oil needs to be at least 30p/litre before payback periods under 10 years are achieved. Current UK prices are around 20p/litre¹. Payback incentive is also compounded by the fact that people in the UK tend to move house relatively frequently.

¹ www.jwilloughby.fsbusiness.co.uk

Perhaps more immediately noticeable to householders are the higher capital costs when compared to most conventional alternatives. Many will not have access to the additional upfront capital needed for a wood-fired heating system.

c) Storage requirements

A further factor discouraging the use of automatic woodchip boilers is the increased storage requirements of wood chip compared to wood pellet fuel. The energy density of heating oil : wood pellets : wood chips is approximately in the region of 1:3:9. The larger hoppers and the more expensive fuel feed mechanisms for woodchip will tend to exclude this fuel for single house usage, other than in certain rural situations e.g. farm houses.

d) Availability and cost of fuel supply

Due to the limitations of storing wood chip as explained above, pellet fuel would seem to hold the greatest potential for the domestic sector. The use of wood pellets in the UK is still reliant on imports, which inflate prices and decrease competitiveness with other fuels. This situation is now changing with two pellet mills now in production and several more due to be commissioned in the near future. However, the supply infrastructure is severely limited and transport costs further decrease competitiveness. Costs would currently be prohibitive for bagged-pellets deliveries unless ordered in large bulk.

The vast majority of biomass heating installations to date have been for 'self-supply' groups. These tend to include large farms or estates with forestry activity where biomass heating systems can be supplied with wood chip produced on-site.

e) Lack of awareness

There is a general lack of awareness among householders of automatic wood heating systems and the associated environmental and social benefits. This serves to prevent the option from being considered when heating systems are being selected. The majority of heating equipment suppliers and installers therefore have no incentive to offer advice or information.

9 RECOMMENDATIONS

Due to the reasons stated in Section 8, few households are likely to adopt automatic wood-fired heating systems in the current market climate. The two crucial barriers are the higher capital costs of domestic automatic wood-fired heating relative to fossil fuel systems, and the lack of infrastructure for wood fuel supply. Hence, any successful implementation project would be reliant on the economics being more favourable to the householder, especially in terms of capital cost, and securing an accessible and reliable supply of fuel.

CSE recommend that the following be considered for implementation as a result of this study:

9.1 Biomass heating 'cluster'

Although implementation of the marketing plan as outlined in Section 7.7 may result in publicising the technology within a selected community, the uptake of wood-fired systems is likely to be limited to a handful of more 'green-inclined' households. However, if such an exercise were combined with further economic incentives, the adoption rate may be increased to more significant levels. Such a project may include the following stages:

- Build on the relationships already established with the villages considered in this study and implement a marketing campaign to target householders already identified as having older boilers due for replacement and those found to have an interest in wood systems.
- If possible, identify a building accessible to the public that is suitable to convert to wood-fired heating in order to publicise a working system.
- Utilise funding to offer pellet boilers to householders at a cost equal to or less than conventional boiler replacements. Aim for a minimum number of installations.
- Offer additional incentives to candidate households for the adoption of appropriate energy efficiency measures.
- Arrange a guaranteed long-term fuel supply and co-ordinate the bulk purchase and storage of pellets.
- Utilise the installations to promote and demonstrate the technology, and monitor day to day operation and user satisfaction within households.

Such a project would require close working relationships with equipment and fuel suppliers, installers, the Parish Council and local district authority. The resulting cluster of household systems could act as a 'beacon' for the technology -the first of its kind in the UK.

9.2 Wood-processing depot

An alternative approach, which aims to stimulate fuel supply networks, may be to build on the results of this study and other initiatives, such as the TreeStation Project, and research the development and funding of a wood-processing depot within a target community. In this case, the business and public sectors would also be targeted in any marketing campaign, as, initially, wood chip production is likely to be the main output, with pellets being delivered from existing production plants and stored in bulk.

10 CONCLUSIONS

1. The size of the main target group, i.e. owner-occupier households using boilers and radiators and either oil, solid fuel, bottled gas or LPG as a principal fuel, within the Local Authority areas considered, has been estimated from EEAC data as being at least 10% of total households. Among this 10%, the potential take-up rate of automatic wood-fired boilers is estimated as being over 4,000 per year. These figures are based on the number of existing appliances that are thought to be in need of replacement each year.
2. To illustrate CO₂ savings, the replacement of 4,000 oil-fired boilers with wood-fired appliances would result in approximately 19,200 tonnes saved per year, based on a household annual oil usage of around 2,000 litres.
3. The questionnaire results indicated that 21% of respondents had central heating boilers more than 15 years old, 8% of respondents had recently considered changing their heating system for *'better control of heat levels'* or because *'current system is inefficient'*, and 7% of respondents had recently considered changing their heating system because the boiler required replacing. Additionally, 15% of respondents would consider paying more for a wood-fired appliance for aesthetic or environmental reasons. The above figures suggest that a significant take-up rate could be achieved within the target areas.
4. There is a large potential resource of wood residue currently being disposed of as waste within the area of study. The 355 tonnes/year of joinery waste identified in the Publow & Pensford region would annually supply around 90 households using pellet boilers as central heating systems, assuming all the waste is appropriate for pellet manufacture. The total wood residue resource tends to originate from a large number of smaller wood businesses scattered throughout the region and many of these have indicated a willingness to dump their waste at no cost, provided a local site was made available.
5. Automatic wood-fired heating systems are now an established and mature technology and can offer an equal level of convenience to fossil fuel equivalents. However, on the basis of this study, the capital costs are unattractive to householders at current prices, even at the current grant levels under the 'Clear Skies' programme. Although pellets are currently a marginally cheaper fuel than oil, capital and running costs for a pellet boiler compared to an equivalent oil system result in payback times of over 10 years at current prices. The situation is not helped by the standard rate of 17.5% VAT on procurement wood boilers compared to 5% on most fossil fuel equivalents.
6. Although wood chip is significantly cheaper than pellets or oil, higher capital costs and practicalities associated with fuel storage will limit the growth of small-scale woodchip-fired systems in the domestic sector. However, larger scale community heating systems using woodchip would benefit from economy of scale.
7. There is currently a severe lack of supply and distribution networks for wood chips and pellets within the area, creating a barrier to the establishment of a market for wood-fired heating appliances.

8. There is a general lack of awareness of automatic wood-fired heating amongst householders in the areas of study, although the level of interest in alternative heating systems was found to be high.
9. Significant levels of uptake are only expected with an increase in production of pellet fuel together with initiatives for supply and distribution such as the introduction of localised wood-processing depots. Further economic incentives are also required, as illustrated by the rapid growth of biomass heating in parts of northern Europe, where the industry has been driven by a combination of domestic carbon tax on fuels and subsidies on equipment. For example, oil is approximately 33% more expensive than pellet fuel in Sweden¹. This compares to around 16% higher oil costs over pellets in the UK at prices listed in Appendix F. It is unlikely that significant growth rates in the UK can be achieved without a higher level of government support in this respect.
10. Overall, the study concluded that it is unlikely that any marketing plan relying solely on current market conditions would achieve a significant level of adoption within the target group. Therefore, it is likely that a marketing plan with additional economic incentives, and a proposal for the guaranteed supply of pellets, would serve to 'seed' the technology within a target community. This would serve to promote and demonstrate the technology, and provide an opportunity to monitor day to day operation within households.
11. There is also merit in researching the development and funding of a wood processing depot within a suitable target community. In this case, the business and public sectors would also be targeted along with households, as initially wood chip production is more likely to be the output, with pellets being delivered from existing production plants and stored in bulk.

¹ Low Carbon Heating with Wood Pellet Fuel –report by XCO2 conisbee Ltd.

List of Appendices:

- A: Examples of automatic wood-fired appliances for domestic use**
- B: Wood resource survey**
- C: Questionnaire and results**
- D: Local media for survey areas**
- E: Funding sources**
- F: Fuel prices**

Appendix A: Examples of automatic wood-fired appliances for domestic use



Above left: *Envirofire EF5 – Evolution Pellet Stove*

Above right: *Envirofire Windsor Pellet Stove*

Below: *Passat range of compact hopper-fed boilers*

PASSAT COMPACT HOPPER-FED BOILERS MODEL C1/C2/C4

Automatic biomass boilers for wood pellets, chippings and corn
complete with fuel-hopper, boiler and burner in a compact unit
8kW - 42kW



Appendix B: Wood resource surveyIron Acton & Rangeworthy

Name	Amount Collected	Seasonal Variation	Current Disposal Method	Interest in wood fuel depot	Estimated Annual Green Tonnes	Oven dry tonnes	Energy content (MWh)
Tree Surgeons							
Bitton Tree Care	1 tonne per week	y	Logged or burnt	yes if site local	52	28	145
Cambridge Logging Company	20-30m ³ per week	y	Mulched	yes, very interested	500-1000m ³	n/a	n/a
Gazzard Tree Works	2 tonnes	y	Take to Mount Pleasant Trees	yes	104	56	290
Heritage Tree Services	10-20 tonnes per week	y	Sell to log merchants and garden centres	yes if site local	520	281	1,451
Instant Tree Care	1-2 tonnes per day	y	Taken to field, stored, mulched, sold + recycled at Keynsham	yes possibly	312	168	871
Modern Arboreal Consultancy	small trailer load per day	y	Chip sold and logs for firewood	yes	104	56	290
				Subtotals	1,092	590	3,047
Joiners							
Hendy Joiners	0.5 tonnes every 6-8 weeks	N	Take to a site and pay for disposal - landfill	Very Interested as no cost	n/a	4	21
G Curtis Woodworks	0.1 tonnes per month	n	Wood burner at home and skip	Yes interested	n/a	1	5
				Subtotals	n/a	5	26
				Totals	1,092	595	3,073

Assumptions

- Annual green tonnes is based on typical moisture content of 50-60%, assuming a basic green density of 1 tonne/m³, and packing density of 0.35 for green wood chip
- Conversion to oven dry tonnes based on basic density of 540kg/m³ for oven dry hardwood
- Energy content based on 5167kWh gross calorific value for 1 oven dry tonne

Publow and Pensford

Name	Amount Collected per week	Seasonal Variation	Current Disposal Method	Interest in wood fuel depot	Estimated Annual Green Tonnes	Oven dry tonnes	Energy content (MWh)
Tree Surgeons							
All Tree Services	15-20 tonnes	y	Tip and Sale	Very interested	720	389	2,009
Blagdon Tree Services	5-10 tonnes	y	Tip and collect every 6 months by Fountain Forestry	Very interested	336	181	938
Arboricultural Services	20-50 tonnes	y	Mulch fields	Very interested	1,680	907	4,688
M Williams	1-2 tonnes	y	Municiple Dump	Very interested	30	16	84
				Subtotals	2,766	1,494	7,718
Joiners							
Windsor Joinery	1-2 tonnes	N	Weekly skip	Very interested	n/a	50	258
Belvedere Manufacturing Co	1/2 tonne	N	Council bins	Interested	n/a	50	258
Swanglen Furninture Ltd	3.5 tonnes	N	Amborg wood waste disposal	Interested	n/a	195	1,008
Good Wood Trading Co Ltd	1-2 tonnes	n	Locally dispose	Interested	n/a	60	310
				Subtotals	0	355	1,834
				Total	2,766	1,849	9,552

Assumptions

- Annual green tonnes is based on typical moisture content of 50-60%, assuming a basic green density of 1 tonne/m³, and packing density of 0.35 for green wood chi
- Conversion to oven dry tonnes based on basic density of 540kg/m³ for oven dry hardwood
- Energy content based on 5167kWh gross calorific value for 1 oven dry tonne

Note: Figures for oven-dry tonnage of tree surgeon waste may vary due to seasonal variations in quantity and moisture content.

Appendix C: Questionnaire

Using Wood to Heat Your House

Tell us what you think and you could win one of five **solar-powered radios!**



Who we are and why we need your views

■ The Centre for Sustainable Energy is a Bristol-based charity that promotes and encourages the sustainable use of energy. We are currently undertaking a study in conjunction with South Gloucestershire and Bath & North East Somerset Councils to find out people's views on heating their homes with wood.

Your village has been selected because it is not on a gas main. Households in areas like yours may have inefficient heating systems such

as old oil boilers and coal fires. An alternative to this is to consider modern wood-burning boilers or stoves that use wood pellets or chips.

We would appreciate you spending a few minutes to answer this brief survey. The results will form part of a wider study to assess the general level of interest in switching to wood fuel. Return your form in the enclosed freepost envelope before 12 May 2003 and you stand a chance of winning a solar-powered radio!

■ Modern wood-burning appliances are highly efficient, create very little smoke or ash and come in a range of sizes and designs.

The fuel they use typically comes from sustainable forestry work or is made from recycled wood waste from the timber or wood-working industry. Compared to most other fuels, this is better for the environment as any carbon dioxide released during burning tends to be re-absorbed in new tree growth.



BATH & NORTH EAST SOMERSET



CENTRE FOR SUSTAINABLE ENERGY



South Gloucestershire Council

About you and your home

1. Do you own or rent your property?

- Own
 Rent

If you rent, some of the following questions may not be relevant.

However, we would still like to receive your completed questionnaire.

2. What is your property type?

- Detached/Semi-detached
 Terrace
 Flat/Maisonette

3. When was your property built?

- Pre 1930
 1930-1976
 1977-1981
 1982-1989
 1990-1995
 After 1995

4. Do you plan to move house within...

- Less than 2 years
 2-5 years
 5-10 years
 No plans to move

5. Do you have any of the following?

- Cavity wall insulation
 At least 150mm (6") of loft insulation
 Double glazing
 Draughtproofing

6. Grants may be available for certain household energy-saving measures. Would you be interested in finding out more?

- Yes
 No

7. Is any member of your household over 60?

- Yes
 No

8. Is any member of your household in receipt of means-tested benefits, e.g. income support, council tax benefit, disability allowance, etc.?

- Yes
 No

9. How many people in your home are under 16?

- None
 1
 2
 3
 4
 More

10. Please describe your gross annual household income:

- Less than £10,000
 £10,000-£20,000
 £20,000-£30,000
 £30,000-£40,000
 £40,000-£50,000
 More than £50,000

About your heating system

11. What is your main heating system?

- Central heating (e.g. boiler and radiators)
 Electric storage heaters
 Warm air system
 Room heaters or stoves
 Open fires

12. What is your main heating fuel?

- Electricity
 Oil
 LPG (bulk gas, in an outside storage tank)
 Bottled gas
 Solid fuel (coal, smokeless, etc.)
 Solid fuel (wood)

13. What is the age of your main heating system?

- Less than 5 years
 5-10 years
 10-15 years
 15+ years

14. What type of 'secondary' heating do you have?

- None - only that stated in Question 11
- Electric/gas/oil room heaters
- Solid fuel fires

15. What is your 'secondary' heating fuel?

(Please tick **all** that apply)

- Electricity
- Oil
- LPG (bulk gas, in an outside storage tank)
- Bottled gas
- Solid fuel (coal, smokeless, etc.)
- Solid fuel (wood)
- Not applicable

16. How is your hot water heated?

- From main heating system
- Electric immersion
- Electric instantaneous (over the sink)
- Back boiler

17. Is your chimney in working order?

- Yes
- No
- Don't know
- Do not have a chimney

18. Do you have available storage space which could be used to store solid fuel such as wood (e.g. garage, shed, etc.)?

- Yes
- No
- Maybe

19. Have you ever seen or heard of wood 'pellets' used for household heating?

- Yes
- No

20. Have you recently considered changing your heating system or adding extra heating appliances?

- Yes
- No

If 'yes' please state main reason:

.....

.....

.....

21. How do you rate your heating system?

1 = Poor 2 = Average 3 = Good
 4 = Excellent 5 = Don't know
 (Please circle)

Value for money (to buy and install) 1 2 3 4 5

Fuel cost 1 2 3 4 5

Cleanliness 1 2 3 4 5

How easy it is to use 1 2 3 4 5

How easy it is to control the heat 1 2 3 4 5

How well it heats your home 1 2 3 4 5

How easy it is to get fuel for it 1 2 3 4 5

How environmentally friendly it is 1 2 3 4 5

22. If your heating system or appliance needed replacing would you continue using the same fuel or would you consider alternatives?

- Same fuel
- Consider alternatives

Please state main reason for your answer:

.....

.....

.....

.....

Your thoughts on using wood as a heating fuel

23. What are your impressions of wood-burning appliances?

1 = Poor 2 = Average 3 = Good
4 = Excellent 5 = Don't know
(Please circle)

Value for money (to buy and install)	1	2	3	4	5
Fuel cost	1	2	3	4	5
Cleanliness	1	2	3	4	5
How easy it is to use	1	2	3	4	5
How easy it is to control the heat	1	2	3	4	5
How well it heats your home	1	2	3	4	5
How easy it is to get fuel for it	1	2	3	4	5
How environmentally friendly it is	1	2	3	4	5

24. What are the three most important factors that would influence your decision to switch to wood fuel? (Please circle **three**)

- Value for money (to buy and install)
- Fuel cost
- Cleanliness
- How easy it is to use
- How easy it is to control the heat
- How well it heats your home
- How easy it is to get fuel for it
- How environmentally friendly it is

25. Would you consider paying more for a new wood-fired heating system than for an equivalent oil/LPG/coal/electric system?

- No
- Maybe
- Yes

Please state a brief reason for your answer:

.....

26. Would you be interested in attending a local event to demonstrate modern wood-fired burners and find out more information?

- Yes
- No

To be entered into our prize draw, please provide your details below and return your questionnaire in the envelope provided (NO STAMP NEEDED) before 12 May 2003.

Name **Address**

.....

..... **Tel No**

Many thanks for your time!

Centre for Sustainable Energy, The CREATE Centre, Smeaton Road, Bristol BS1 6XN

Registered charity no.298740

Questionnaire Results

About you and your home...		Response [%]
1. Do you own or rent your property?	Own:	91
	Rent:	9
2. What is your property type?	Detached/Semi-detached:	86
	Terrace:	13
	Flat/Masionette:	1
3. When was your property built?	Pre 1930:	55
	1930-1976:	32
	1977-1981:	2
	1982-1989:	4
	1990-1995:	4
	After 1995:	3
4. Do you plan to move house within...	Less than 2 years:	13
	2-5 years:	5
	5-10 years:	9
	No plans to move:	77
5. Do you have any of the following?	Cavity Wall Insulation:	30
	At least 150mm loft insulation:	60
	Double Glazing:	90
	Draughtproofing:	35
6. Grants may be available for certain household energy-saving measures. Would you be interested in finding out more?	Yes:	71
	No:	29
7. Is any member of your household over 60?	Yes:	30
	No:	70
8. Is any member of your household in receipt of means-tested benefits e.g. income support, council tax benefit, disability allowance, etc.?	Yes:	9
	No:	91
9. How many people in your home are under 16?	None:	68
	One:	10
	Two:	17
	Three:	4
10. Please describe your gross annual household income:	<£20k:	31
	£20k-£40k:	30
	>£40k:	39

About your heating system...		
11. What is your main heating system?	Central Heating:	85
	Electric Storage Heaters:	9
	Room Heaters or Stoves:	6
	Open Fires:	7
12. What is your main heating fuel?	Electricity:	10
	Oil:	65
	LPG:	8
	Bottled Gas:	5
	Solid Fuel(coal, smokeless etc):	11
	Solid Fuel (wood):	6
13. What is your age of your main heating system?	Less than 5 years:	24
	5-10 years:	26
	10-15 years:	25
	15+ years:	25
14. What type of secondary heating do you have?	None – only that stated in Q11:	18
	Electric/gas/oil room heaters:	26
	Solid Fuel Fires:	61

15. What is your secondary heating fuel?	Electricity:	25
	Oil:	3
	LPG:	1
	Bottled Gas:	7
	Solid Fuel (coal, smokeless etc):	32
	Solid Fuel (wood):	64
16. How is your hot water heated?	Not applicable:	5
	From main heating system:	79
	Electric Immersion:	31
	Electric Instantaneous:	1
17. Is your chimney in working order?	Back Boiler:	9
	Yes:	84
	No:	4
	Don't know:	8
18. Do you have available storage space which could be used to store solid fuel such as wood (e.g. garage, shed, etc.)	Do not have a chimney:	4
	Yes:	83
	No:	6
19. Have you ever seen or heard of wood pellets used for household heating?	Maybe:	11
	Yes:	29
	No:	71
20. Have you recently considered changing your heating system or adding extra appliances	Yes:	33
	No:	67
21. How do you rate your heating system?		
Value for money (to buy and install)	Poor:	10
	Average:	29
	Good:	35
	Excellent:	14
	Don't know:	12
Fuel cost	Poor:	21
	Average:	36
	Good:	33
	Excellent:	5
	Don't know:	4
Cleanliness	Poor:	14
	Average:	19
	Good:	27
	Excellent:	31
	Don't know:	8
How easy it is to use	Poor:	8
	Average:	15
	Good:	31
	Excellent:	40
	Don't know:	5
How easy it is to control the heat	Poor:	16
	Average:	13
	Good:	35
	Excellent:	31
	Don't know:	5
How well it heats your home	Poor:	11
	Average:	18
	Good:	34
	Excellent:	33
	Don't know:	4
How easy it is to get fuel for it	Poor:	2
	Average:	10
	Good:	31
	Excellent:	50
	Don't know:	7
How environmentally friendly it is	Poor:	11
	Average:	34
	Good:	24
	Excellent:	11
	Don't know:	20

22. If your heating system or appliance needed replacing would you continue using the same fuel or would you consider alternatives?	Same Fuel:	27
	Consider Alternatives:	73

11 YOUR THOUGHTS ON USING WOOD AS A HEATING FUEL...		
23. What are your impressions of wood-burning appliances?		
Value for money	Poor:	6
	Average:	21
	Good:	27
	Excellent:	8
	Don't know:	38
Fuel Cost	Poor:	6
	Average:	15
	Good:	30
	Excellent:	14
	Don't know:	35
Cleanliness	Poor:	29
	Average:	27
	Good:	20
	Excellent:	2
	Don't know:	23
How easy it is to use	Poor:	16
	Average:	26
	Good:	27
	Excellent:	7
	Don't know:	24
How easy it is to control the heat	Poor:	21
	Average:	28
	Good:	20
	Excellent:	4
	Don't know:	27
How easy it heats your home	Poor:	6
	Average:	22
	Good:	26
	Excellent:	18
	Don't know:	28
How easy it is to get fuel for it	Poor:	9
	Average:	13
	Good:	32
	Excellent:	21
	Don't know:	25
How environmentally friendly it is	Poor:	7
	Average:	15
	Good:	29
	Excellent:	22
	Don't know:	27

24. What are the three most important factors that would influence your decision to switch to wood fuel?		
How well it heats your home	68	
Fuel Cost	59	
Value for money	45	
How easy it is to use	29	
How easy it is to get fuel for it	27	
How environmentally friendly it is	26	
How easy it is to control the heat	25	
Cleanliness	15	
25. Would you consider paying more for a new wood-fired heating system than for an equivalent oil/LPG/coal/electric system?	No:	30
	Maybe:	63
	Yes:	8
26. Would you be interested in attending a local event to demonstrate modern wood fired burners and find out more information?	Yes:	57
	No:	43

Appendix D: Local media for survey areas

Regional

Bath Chronicle
Bristol Evening Post (specific editions cover these areas)
Western Daily Press
Venue Magazine
The Spark (green press)
Bristol Observer (specific editions cover these areas)

Local

Somerset Standard
Somerset Guardian
Chew Valley Gazette
Chew Valley Paper
Your Somerset (council paper)
Mendip Life
Tenant Times (SGlos council)
Networking News (SGlos council)
Gloucester Citizen
Gloucestershire Echo
North Avon Gazette
Bristol Journal/Gazette
Cheltenham & Gloucester Independent Newspaper
Pensford Parish Magazine (also online at <http://members.lycos.co.uk/pensford>)

RADIO

Bath's GWR 103FM
107.9 Bath FM
BBC Radio Bristol
BBC Somerset Sound 1566AM
Bristol's GWR FM
Star 107.3 FM
Vibe 101
Passion for the Planet
Orchard FM
BBC Radio Gloucestershire

WEB

www.bbc.co.uk/bristol - BBC Bristol website, carries local news and 'green city' section
www.pensford.com - community website for Pensford and Publow villages
www.digitalbristol.co.uk – information on all aspects of life in and around Bristol

Appendix E: Funding sources/economic incentives

Name	Clear Skies
Description and main criteria	<p>Fixed grants are available on a range of renewable installations, with separate conditions for household and community applications. Technologies supported include solar water heating, micro-wind, micro-hydro, ground source heat pumps powered by renewable electricity, automated wood pellet fuel stoves and wood fuelled boiler systems.</p> <p>Household applications – fixed grants of £600 for automated wood pellet stoves and £50 per kWth for wood-fired boiler systems. Installations larger than 30 kWth are allowable but capacity above that level will not incur a grant. Up to 2 grants per household are possible, provided that they are for 2 different technologies.</p> <p>Community applications are invited from community/environmental groups, local authorities and public service organisations. SMEs are not eligible. Applicants must demonstrate evidence of real community involvement and engagement and must enhance public awareness/ understanding of renewable energy. Preference is shown for schemes that; are located in an area of social need; can demonstrate cross-community involvement; have evidence of match funding.</p> <p>The following conditions apply to both community and household applications: schemes must use components on the DTI's approved product list; all measures must be professionally installed; grant applications can not be retrospective.</p>
Funder	DTI
FUNDING TYPE	Feasibility and Capital funding available
Amount of Funding per project & Leverage	<p>Household - fixed grants vary from £500 to £5000 depending on the technology</p> <p>Community - Maximum of 50% of total capital and installation costs or £100,000, whichever is smaller. Development funding is available - 75% of feasibility study costs or £10,000, whichever is smaller</p>
Date of next call	<p>Household grant applications can be made at any time</p> <p>Community applications – Four competitive funding rounds will be held per year. Forthcoming deadlines: 2/5/03, 1/8/03. 31/10/03, 30/1/04.</p> <p>Application forms available from the Clear Skies website</p>
Contact for more information	www.clear-skies.org

Name	Regional Electricity Supplier Funds – e.g. Scottish Power's Green Energy Trust
Description and main criteria	<p>Green funds are set up by electricity suppliers which have fund-based green electricity tariffs. The premium paid by customers contributes to the fund to support the development of new renewable energy projects. Usually projects funded under the scheme must be located within the supplier's traditional supply area. Npower's renewable energy product 'Juice' is for green supply and currently has no fund attached to it for project work. Scottish Power's Green Energy Trust, does not restrict applications by geographical area. The fund aims to create new renewable energy sources; encourage R&D in renewable electricity; promote education in the community on renewable energy generation</p>
Funder	Scottish Power (Green Energy Trust)

FUNDING TYPE	Development and Capital funds
Amount of Funding per project & Leverage	The Green Energy Trust will fund up to 50% of total project costs
Date of next call	Applications are considered at least 3 times a year
Contact for more information	http://www.scottishpower.com/pages/aboutus_ourcustomers?nav=ourcustomers

Name	National Grid Community 21 Awards Scheme
Description and main criteria	The scheme aims to improve the environmental, social and economic quality of life in local communities by providing support for innovative sustainable development community projects run by local authorities across England and Wales. Funding can be in support of new initiatives or development of an existing initiative.
Funder	National Grid UK
FUNDING TYPE	Development and capital funds
Amount of Funding per project & Leverage	A maximum of £5,000 available per project. £10,000 available to the most innovative community projects demonstrating best practice in "Community Leadership".
Date of next call	TBA – probably Summer 2003
Contact for more information	http://www.nationalgrid.com/uk/social&environment/sponsorship Nadia Farrell, Tel: 01727 850761

Name	The Landfill Tax Credit Scheme
Description and main criteria	The LTCS offers tax breaks to Landfill Operators to support environmental projects. Environmental organisations can receive landfill money either directly, by registering with ENTRUST as an Environmental Body, or indirectly, via a Distributive Environmental Body. The LTCS website gives lists of DEBs by geographical region. There are several local and national DEBs servicing the South Glos area. Each has different funding priorities and programmes. LTCS funds must be spent in compliance with landfill tax regulations – e.g. projects that encourage the development of projects from waste, land reclamation, pollution reduction, education on waste issues and other schemes promoting environmental improvement. Some projects must be within 10 miles of a landfill site
Funder	Individual LOs or DEBs (see LTCS website for a directory)
FUNDING TYPE	Capital and development
Amount of Funding per project & Leverage	Varies according to DEB and programme. Most expect a 10% third party contribution (which may be other grant funding). Two-thirds of all landfill tax credits collected after 1/4/03 will be diverted to public spending on strategic waste projects. Thus funds available for recycling and waste projects will be severely curtailed
Date of next call	Varies according to DEB and programme
Contact for info:	http://www.ltcs.org.uk ; http://www.entrust.org.uk

Name	SEED
Description and main criteria	Projects funded through the SEED programme aim to support local community development and support the development of community enterprise. They must focus on helping disadvantaged communities improve the quality of their environment and promote a more sustainable lifestyle. Community renewables projects, including biomass are supported via the energy efficiency stream. Other streams include waste minimisation, recycling and reuse; environmental education; consumption and lifestyles; sustainable transport; local food initiatives and biodiversity. Preference will be given to projects that address more than one programme theme.
Funder	The New Opportunities Fund (National Lottery)
FUNDING TYPE	Major capital outlay cannot be funded.
Amount of Funding per project & Leverage	Grants will rarely exceed £50K. Those that do must achieve 50% match funding and submit a business plan. Applicants must attract at least 50% match funding, of which 30% must be cash. There is a fast track programme for projects between £500 and £4999.
Date of next call	SEED is a rolling programme that will cease at the end of 2004. Applications are considered in Feb 2003, May 2003, Aug 2003, Nov 2003, Feb 2004. Work must be completed by Dec 04.
Contact for more information	http://www.rsnc.org/seed/

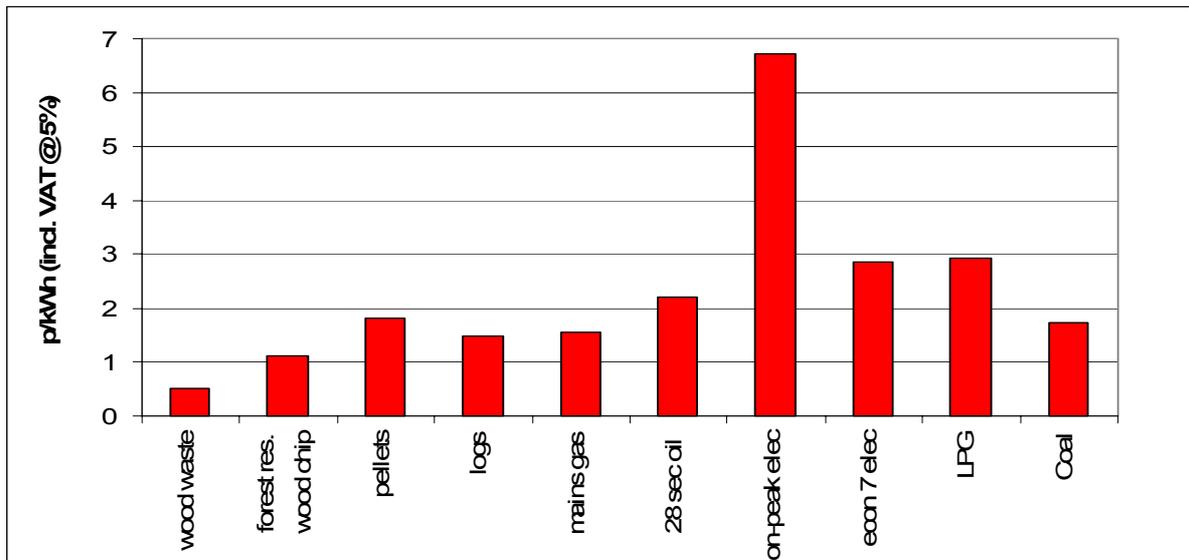
Name	Community Energy Programme
Description and main criteria	Provides capital and development grants for new, and the refurbishment of existing, CHP and district heating schemes. It is one of the key mechanisms for the Government to achieve targets set in the Fuel Poverty Strategy for eradicating fuel poverty in vulnerable households by 2010. Grants are available to Local Authorities, Registered Social Landlords, hospitals, universities and other public service organizations. The development funding stream provides 50% funding for projects not ready to apply for capital funding (e.g. to support a feasibility study)
Funder	The Energy Saving Trust and The Carbon Trust
FUNDING TYPE	Capital and development
Amount of Funding per project & Leverage	Capital: The programme will fund a maximum of 40% of the scheme cost, although the target is to fund 20% or less. Increasing leverage from other sources will improve the bid's chance of success Development: Grants of up to 50% of the total cost of the development work are available. Projects requesting up to £25k are usually approved more quickly than larger development grants which need the approval of an independent advisory panel.
Date of next call	Calls are quarterly. The next deadline is likely to be 31 July 03
Contact for more information	http://www.est.co.uk/communityenergy Email: communityenergy@est.co.uk Tel: 0870 8506085

Name	Energy Loans
Description and main criteria	Interest free loans available to SMEs (including independent schools) for the purchase of energy efficiency measures with a pay back period of up to 5 years. Loans are available from £5,000 to £50,000 on measures that can demonstrate real energy savings. The repayment period is up to 4 years. It is anticipated that in most cases the loan repayments will be off-set by energy savings.
Funder	The Carbon Trust (ActionEnergy programme)
FUNDING TYPE	Loan

Name	Enhanced Capital Allowance Scheme
Description and main criteria	The Enhanced Capital Allowance (ECA) scheme provides tax incentives for all companies purchasing low carbon/energy saving technologies. The list of eligible technologies includes CHP and boilers. ECAs permit the full cost of the investment in equipment that are on the 'Energy Technology Product List' to be relieved for tax purposes against taxable profits of the period of the investment. The product list can be viewed on-line at the website address below.
FUNDING TYPE	Tax incentive
Contact for more information	http://www.eca.gov.uk

Name	Climate Change Levy
Description and main criteria	The climate change levy was introduced in April 2001 as part of the government's commitment to reduce carbon dioxide emissions by 12.5% by the year 2010. It applies to all businesses using energy generated from fossil fuels. The levy is charged at a flat rate on each kWh of energy consumed at the rates specified below. Energy intensive industries are eligible for discounts of up to 80% in return for a legally binding commitment to an energy reduction target over a ten year time frame. All business using energy generated from renewable sources are exempted from the levy.
FUNDING TYPE	Business Tax
Levy rates	Electricity 0.43p/kWh Natural gas 0.15p/kWh Coal/ignite 0.117p/kg (approx 0.15p/kWh) LPG 0.96p/kg (approx 0.07p/kWh) Oil products are exempt because they already carry excise duty.
Contact for more information	http://www.climate-change-levy.info

Appendix F: Fuel prices



Type of Fuel	short name	£/ tonne (excl. VAT)	Moisture Content (%)	Energy Content (kWh)/tonne	Fuel cost (p/kWh) (inc. VAT @5%)
recycled, untreated wood waste chip (e.g. pallets) (1)	wood waste	£22	15	4,318	0.51
forestry residue wood chip (2)	forest res. wood chip	£40	25	3,730 (wet tonne)	1.13
pellets (2)	pellets	£80	10	4,694 (4)	1.80
logs (3)	logs	£55	25	3,730 (wet tonne)	1.47
mains gas	mains gas	-	-	-	1.55
oil	heating oil	-	-	12,093	2.10
electricity (on-peak)	on-peak elec	-	-	-	6.72
electricity (economy 7)	econ 7 elec	-	-	-	2.85
LPG	LPG	-	-	-	2.93
Coal	Coal	£145	-	-	1.74

1) based on price from Churngold

2) based on bulk purchase price supplied by Renewable Heat & Power Ltd.

3) based on price from CREST distance learning CD

4) assumes a minimum calorific value of 16.9MJ/kg as stated in the British Biogen Code of Practice for biofuel pellets

prices for electricity, coal and gas based on john willoughby, apr 02

gas price is based on consumption of 30,000kWh per year, @1.44p/kWh plus £8 per qtr standing charge

Cost of oil

20 p/litre

Mar-03