

The Country House

Wood Fuel Heating Options

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Please note that the figures given in this report are estimations only, and no investment in energy efficiency measures or heating equipment should be made without a further analysis of requirements, benefits and costs. Neither Jacinta MacDermot nor Wood Fuel Powys can take any responsibility for the implementation of any of the measures outlined in this report.

Introduction

The house is a large stone built building which was formerly part of an hotel.

The building is built around three sides of a courtyard open to the west, with accommodation provided in the south and east wings. On the north side are a log store and store room. Part of the inhabited building is double-storey, while the living room / dining room is single storey. The area below the bedroom on the east side is un-heated.

Methodology

Two different methods can be used to estimate the annual heating requirements of the building.

- 1) Gathering data from previous fuel bills
- 2) Calculating how much energy would be required to heat the building based on heat loss through the walls, floor and roof of the building.

Unfortunately no winter fuel bills were available, although it is estimated that the monthly gas bill is around £90 per month, and this has been used to estimate annual fuel use.

Calculating heat loss through the fabric of the building is very complex because of the building's layout, and lies outside the scope of this study.

Current Energy Use

The building is currently heated by gas through wall mounted radiators. There is also a multi-fuel stove in the living / dining room, and a gas fired AGA in the kitchen.

It is estimated that about £90 per month on average is spent on gas throughout the year.

Using the average price paid in the summer of 2006 (3.349p/kWh including VAT) this equates to 2,687kWh per month. Over the year this works out at a total of 32,244kWh. The majority of energy will be used in during the heating season (October to May inclusive) with lighter use over the summer.

However the reliability of these figures is not certain – on the AGA manufacturer's website, it states that a 4 oven gas-powered AGA without water heater uses an average of 527kWh per week. This would equate to a total of 27,404 kWh per year of energy use just for the AGA, which would suggest an unfeasibly low figure of just under 5,000kWh for the remainder of the heating and hot water for the house over the year.

However for the purposes of this study and to give some comparative costs, it will be assumed that annual energy consumption for heating, hot water and cooking is 32,000kWh. This is likely to be lower than the real energy consumption of the house, but ties in with quoted gas use. It is essential that actual heat requirements and size of boiler is calculated by a qualified heating engineer before investing in a new heating system.

Reducing energy demand

The house is an old building which has undergone some renovation in recent years. As old windows are replaced, new wooden double-glazed windows are being installed, but the majority of windows are still single-glazed as is the kitchen and some other doors.

Walls are assumed to be of solid stone construction without any insulation or dry lining. The ground floor is solid concrete and is assumed not to be insulated. Insulating the walls greatly increases the energy efficiency of a building, though is often not undertaken in existing buildings because it can be disruptive and relatively expensive, and if installed internally, reduces living space.

The floor below the recently-renovated bedroom has been insulated to current building regulation standards.

Roofs are assumed to have been insulated to 100mm. If possible, this should be increased to the recommended 270mm.

The gas-fired AGA is likely to be the most energy-hungry appliance in the house. AGAs are an inefficient source of heat and a gas-fired AGA using an average of 527kWh energy per week would be responsible for the emission of over 7 tonnes of CO₂ emissions per year. A more environmentally-friendly option would be a wood-fired cooking range, some of which can also run off wood pellets (see below).

Possible heating options

Why wood fuels?

Wood fuels are seen as a good heating option for a number of reasons:

- Although wood emits carbon dioxide when burnt, this is the same carbon dioxide that is absorbed by growing trees. The carbon cycle is very short in this case, whereas fossil fuels release carbon dioxide that has been locked up for millions of years.

- Using locally produced wood fuels encourages the management of Welsh woodlands which can be good for biodiversity
- Using wood fuels invests money in the local economy and can make farming and wood processing businesses more viable. Pellets, made from sawdust and offcuts from wood processing, can offer an alternative market for what might otherwise be a waste product.
- Using locally-sourced fuels ensures security of supply, rather than being reliant on imports from the Middle East and elsewhere.

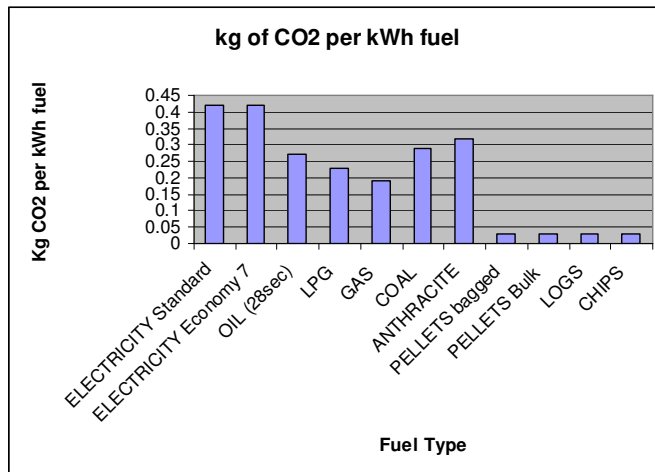


Table 1: Carbon dioxide emissions from various heating fuels. Emissions shown from wood fuels assumes that CO2 released is absorbed by growing trees (therefore not shown). CO2 emissions shown for wood fuels are those related to harvesting, extraction, transport and processing.

However wood fuels are only an environmentally friendly option if burnt efficiently. Burning wet wood in an open fire or inefficient wood-stove can release dioxins and other pollutants into the atmosphere. Logs should be seasoned for at least a year or more before being burnt, and stoves, boilers and flues should be regularly maintained for optimum efficiency.

Apart from log stoves, which are widely available and relatively cheap, wood-fuel heating systems tend to have high capital costs – far greater than mass-produced oil or gas boilers. Although wood-fuel systems can have lower running costs, it shouldn't be assumed that the fuels will always be considerably cheaper than fossil fuels.

Which Fuel?

When choosing a wood-fuel heating system it is essential to consider where you will source your fuel, how much storage space you have available and the amount of user-input you are prepared to put in. You also need to consider whether you want a 'living-flame' to look at in your living room and whether you want a system that will come on automatically whether you are at home or not.

Some of the characteristics of various heating systems are listed below:

	Log stove	Log boiler	Ceramic Stove	Pellet Stove	Pellet boiler	Chip boiler
Single room	●		●	●		
Whole house	●	●			●	
Larger house		●			●	●
Group of properties					●	●
Wish to use own fuel	●	●	●			●
Domestic hot water	●	●		●	●	●
Attractive feature	●		●	●		
Boiler space required		●			●	●
Level of automation	0	1-3	0	2-4	3-5	3-5
	0 = no automation 5 = complete automation					

(From Wood Fuel in Wales leaflet, B Horne)

Delivery of heat and hot water

A wood-fuelled heating system could connect to the existing radiators and would also provide hot water. In the summer, solar water heating could provide the majority of hot water, when the wood-fuelled system might not be running. A gas back-up system could also be incorporated.

Wood Stove or Wood Stove with back boiler

The existing multi-fuel burner can supplement the gas central heating system and provide heat for the living / dining room. A dedicated wood stove is likely to be more efficient than a multi-fuel stove when burning logs, as it is built specifically for that purpose.

An efficient wood stove with a back boiler (around 60 - 70% efficient) could be used in place of the existing multi-fuel stove and be connected to radiators and to the hot water cylinder. However it is understood that the occupants would like an automated heating system, and there are concerns about the amount of dust emitted from the wood stove. This option is not therefore recommended for this house.

Pellet room heaters

A pellet room heater could provide a supplementary, more controllable heat source in the living / dining room, whilst still providing a 'living flame'. Although pellet room heaters can also provide hot water to radiators and to the domestic hot water system, it is suggested that at the house it would be used mainly to supplement space heating in the room that is used the most. Thermostatic valves on the radiators would ensure that when the room heater is in use, the gas boiler is not providing heat to the radiators in that room unless necessary.



Rika Pellet Room Heater

Pellet room heaters have an integral hopper in which pellets for up to three days or so can be stored. As pellets are uniform in shape and size, are very energy dense and can be trickle fed into the combustion chamber, pellet stoves can be relatively automatic and heat can be regulated by a thermostat.

Pellet room heaters require electricity and use a fan to control combustion and distribute heat. It is worth bearing in mind that the fans can make a low-level noise.

It is assumed that the existing flue is suitable for use with a pellet room heater, though this should be checked with the installer.

Pellet room heaters are available from a variety of installers, including some of those listed at the end of this report.

Capital Costs

Pellet room heater £3000 - £4500 including VAT

Running costs

The price of pellets varies according to the quantity bought and delivery distance. Pellets in bags from Fast Forward Energy in Llandrindod Wells cost in the region of £184 tonne including VAT, but excluding delivery. Costs could probably be reduced by collecting pellets from the manufacturer in Llandrindod Wells.

Grants

Approved pellet room heaters are eligible for support under the Low Carbon Building Programme of a maximum of £600 regardless of size subject to an overall 20% limit (exclusive of VAT).

Pellet or log-fired cooking ranges

Highly efficient wood-fired cooking ranges such as Wamsler are available in the UK, and can provide cooking and hot water / space heating running off logs. The German company Lohberger manufactures range cookers that can run off solid fuels including logs, and also have a supplementary pellet hopper, which will automatically supply the firebox with pellets if the logs have burnt out.

If a range cooker is being relied on for cooking then a good supply of seasoned logs / pellets must be secured and the costs / labour involved should be considered. Details of Wamsler cookers can be found in Appendix 2 along with information in German about Lohberger log / pellet cookers. Both makes are available in the UK, and further information can be provided if required. An appropriate flue system would be required.

Capital costs

Wamsler range cookers start from £1795 including VAT but excluding installation and delivery.

Log Boilers

The gas central heating system could be replaced with a wood-fired boiler running off either logs or pellets. As there is some wood available at the property, a log-fired boiler would enable the occupants to supply some of their own fuel. However the labour involved in this, and in managing a fuel supply and loading up the boiler is not insignificant.

Log boilers are 'batch' boilers, meaning they are fed with batches of logs which are burnt very hot and fast over a couple of hours. During the winter a log boiler may need to be filled and lit once a day. In the spring and autumn once every two days may be sufficient. Softwoods, hardwoods and briquettes can be used in combination to provide the heat output required.

Log boilers require an accumulator or buffer tank – a very large hot water store of perhaps 1000 litres which stores the heat from the boiler until it is required. The advantage of this is that you do not need to light the boiler when you require heat, and the boiler can work flat-out at its most efficient. A timer and / or thermostat can provide heat to the radiators when you require it.

A log boiler could be housed in the existing log store or adjacent stable block. It would be connected to radiators and the hot water cylinder in the house via a short length of underground heat main (super-insulated pipe) and a heat exchanger.



Baxi log boiler and accumulator tank

Log boilers can be much more efficient than log stoves and approximately 12 tonnes of seasoned logs (30%moisture content) per year would provide 32,000kWh of heat, requiring 29m³ of storage space.

Suppliers / installers of log boilers are listed below.

Advantages

Can be highly efficient
You do not need to light the boiler when you want heat
Only requires filling once a day or so
Logs need not be carried through the house
Fuel widely available
Can use longer lengths of wood than with a woodstove

Disadvantages

Large space needed for boiler and accumulator
Large storage space needed for logs
Fuel needs processing / stacking / loading
Can be hard to source seasoned logs
High capital costs

Capital costs

Log boiler (installed) and flue £7,000 - £12,000
Accumulator tank (1000 litres) £800 - £1500
Heat main + civil works £500

Running costs

12 tonnes of logs at 30% moisture content could cost around £821 if bought from a supplier for £70 a tonne. The time required for stacking and moving logs should also be considered.

Grants

Approved domestic log boilers are eligible for support under the Low Carbon Building Programme of a maximum of £1500 regardless of size subject to an overall 30% limit (exclusive of VAT).

Pellet boiler

A pellet boiler can provide a highly automated form of wood heating for space and water. A pellet boiler, like a log boiler, will sit in an outhouse or utility room rather than in the space to be heated. Unlike log boilers, a large accumulator or heat store tank is not always necessary. Pellet boilers have an automatic feed system which means little user input is required. The most sophisticated systems may need little more than a fuel delivery once a year (if there is sufficient storage space for a year's supply of pellets), a routine monthly maintenance check and occasional emptying of ash.

To provide 32,000kWh of heat with pellets, about 7 tonnes will be required per year, needing a storage space of 11m³

Advantages

Can be highly automated
Little user input required
Controllable heat
Less space required for fuel storage (than logs)

Disadvantages

Pellets not widely available
High capital costs
Relatively high running costs

Capital costs

Pellet boiler, flue and storage hopper £6000 - £11,000
Heat main £500

Running costs

7 tonnes of pellets might cost around £1433 per year, depending on quantities delivered.

Grants

As with log boilers, domestic pellet boilers are eligible for support under the Low Carbon Building Programme of a maximum of £1500 regardless of size subject to an overall 30% limit (exclusive of VAT).



Okofen Pellet Boiler

Wood Chip

Wood Chip Boilers are only available with a rated output sufficient for a very large house, commercial building or groups of buildings. Wood chip boilers are at their most efficient when running flat out, and unlike pellet boilers are less comfortable being turned down to operate at a fraction of their rated output. They are not suitable for most domestic properties. They can be highly automated and can use locally sourced wood chip (depending on quality) which is generally lower in price than other wood fuel options. Wood chip is not considered to be an option for this house.

Solar Water Heating

In the summer, domestic hot water could be provided by solar water heating panels, situated on a south facing roof. At this house, the most likely position would be the south-facing roof if

the solar water heating were to be connected to the existing gas system. Should a wood-fired central heating system be installed, the solar water heating could be located on the roof above the stables. An array of around 3 m² could provide enough hot water for the house during the summer. Detailed system design needs to be carried out to establish the best way of incorporating solar water heating into the heating system, taking into account the pattern of usage by occupants. Solar water heating should be able to provide up to 50 to 60 % of hot water over the year, and the majority of hot water during the summer. Grants of an overall maximum of £400 or 30% of the relevant eligible costs, whichever is the lower, are available from the Low Carbon Building Programme.

Grants

Grants mentioned above are from the Low Carbon Building Programme. However it should be noted that this grant scheme is very over-subscribed, and many applicants have found it difficult to secure funding. The installation must be carried out by an accredited installer.

Grants of up to 25% on capital costs may also be available through the manufacturer / distributor of equipment, through the Bio-energy Capital Grants Scheme.

It is possible that grants for domestic wood fuel installations may be available in the future from the Forestry Commission. However this is by no means certain.

LOW CARBON BUILDINGS PROGRAMME GRANT

0800 915 7722

www.lowcarbonbuildings.org.uk

Grant scheme for domestic and community renewable energy systems. For domestic wood systems, pellet room heaters and stoves are eligible for a maximum grant of £600 regardless of size, subject to an overall 20% limit (exclusive of VAT). For domestic wood fuelled boiler systems, a maximum grant of £1,500 is available, regardless of size but subject to an overall 30% limit (exclusive of VAT). Grants are also available to businesses, community groups etc. No grants for conventional wood stoves.

Suppliers and installers

There are several local suppliers and installers of wood fuel heating systems.

4WOOD LLP

Beacon Stoves
Newcastle Emlyn,
Parc Gwair,
Capel Iwan,

Carmarthenshire
SA38 9LT

Tel: 01559 371058

info@beaconstoves.co.uk

www.beaconstoves.co.uk

Supplies and installs small and medium scale wood stoves and boilers, pellet room heaters and boilers and wood chip stoves from 4kW to 100kW.

DERWAS OF WELSHPOOL

Henfaes Lane,

Welshpool

Powys

SY21 7BE

Tel: 01938 552246

www.dragon-stoves.co.uk

Supplies Woodpecker pellet boilers from Gerkros, Ireland. Pellet boiler installed at premises.

DULAS Ltd

Unit 1, Dyfi Eco Parc,
Machynlleth,

Powys

SY20 8AX.

Tel: 01654 705 000

dulas@dulas.org.uk

www.dulas.org.uk

Supplies and installs wood fuel heating systems including log and pellet boilers.

ORGANIC ENERGY COMPANY

Severn Road,
Welshpool,

Powys
SY21 7AZ.

Tel: 0845 458 4076

ajb@organicenergy.co.uk

www.organicenergy.co.uk

UK distributor for fully automatic Okofen wood pellet central heating boilers, wood pellet room heaters (5kW upwards), high efficiency wood fuelled range cookers and wood pellet fuel.

Also operates a training centre for the installation of Okofen boilers.

REDFYRE COOKERS

Osprey Road
Sowton Industrial Estate,

Exeter

Devon

EX2 7JG

Tel: 01392 261999

wamsler@redgyrecookers.co.uk

www.wamslercookers.co.uk

Supply Wamsler wood fired range cookers and central heating cookers.

VERY EFFICIENT HEATING COMPANY

Old Station,
Machynlleth,

Powys
SY20 8BL.

Tel: 01654 700324

enquiries@veryefficientheating.co.uk

www.veryefficientheating.co.uk

Designs, installs and maintains solar heating (SWH) systems - both flat plate and evacuated tubes – and high efficiency conventional heating and wood burners. 15kW Baxi pellet boiler heats premises. 8kW Pellet room heater also installed.

Pellet suppliers

At present there are only two manufacturers of wood pellets in mid-Wales. However at least two further manufacturers are expected to start production within the next year or so.

FAST FORWARD ENERGY

Waterloo Industrial Estate,
Llandrindod Wells,
Powys
LD1 6BH.

Tel: 01597 823835

Manufactures and supplies pellets in Mid-Wales

WELSH BIOFUELS LTD

32 Chilcott Avenue,
Bridgend,
Brynmenyn Industrial Estate,
Brynmenyn,
CF32 9RQ.

Tel: 01656 729714

ken@welsh-biofuels.co.uk

www.welsh-biofuels.co.uk

Manufactures and supplies wood pellets. Accredited installer of wood-fired boilers & pellet stoves (Froling, Passat and Rika).

Recommendations

Improve energy efficiency as far as possible including draught-proofing, secondary glazing/ double glazing, improved insulation in loft spaces.

Consider how much user-input into a heating system is acceptable, and whether the high capital costs of a wood fuel central-heating system can be accepted in order to allow them to achieve environmental aims.

If a large capital investment is not acceptable, consider using the existing log stove more to supplement heat in the main rooms. Local suppliers of log and pellet boilers and room heaters could be approached for further information.

Should the occupants wish to see a working log or pellet boiler, this could be arranged. When the options have been considered more fully, installers could be approached for quotations to give a more accurate idea of costs.