

Community Energy Savers Report for

Tackley Village Hall

The potential for energy efficiency and microgeneration measures in the domestic properties associated with the British Gas Green Streets project

**Analysis from Green Homes Assessments
Conducted 18th March to 1st April 2010**

1st June 2010



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1 Background

Tackley Village & Green Streets

Tackley Village is one of fourteen projects to have been chosen to compete as part of the British Gas Green Streets project for 2010. Their efforts to date in tackling issues associated with energy waste and deliver energy savings by 25%.

Progress with the Community Buildings

The community building is currently at planning permission stage. Tackley Village Hall is surrounded by conservation areas so West Oxfordshire District Council needs to be informed. The Community centre has had a new quote for a ground source heat pump, distributing heat via convector heaters in main hall.

The Scope of the Green Homes Assessments

The Tackley community leadership team selected a total of 78 households to participate in the British Gas Green Streets project. These properties will receive support from the community and project leaders to fulfil the residential requirements of the Green streets project which will contribute to the overall project objectives of saving energy, generating money and engaging the community.

British Gas worked with Tackley Village community to provide an in-home energy assessment to all participating households. The energy assessments were conducted by a fully qualified British Gas Energy Expert, who spent approximately one and a half hours in each property.

There were three objectives of the energy assessment:

- 1) Attempt to understand the householder's lifestyle and energy behaviours in order to provide tailored recommendations on how to reduce energy consumption
- 2) Perform a full analysis of the fabric of the building and heating system and determine whether energy saving upgrades were suitable
- 3) Perform a "pre-feasibility" analysis of the property to identify possible renewable energy generation opportunities that could be explored further

The energy assessments were carried out from 18th March 2010 until 1st April 2010. A remarkable 92% rate of access was achieved with, 72 properties receiving an assessment. This is testament to the efforts of Tackley project leaders in engaging their participants and arranging the booking times. Those that have not yet had the home assessment complete will be done and added at a later date.

The Purpose of this Report

This report details the outcomes of the in-home energy assessments on the properties selected. It identifies the energy saving products and services that are most suitable for each

property and provides an indication of the amount of energy, carbon and cost savings that can be achieved by taking up these measures.

It also summarises the opportunities for domestic renewable energy generation that were found within the properties. Please note, however, that full technical surveys will be required before an accurate quote can be made or any of the renewable systems or larger energy efficiency measures can be installed.

This document is designed to assist Tackley Village to come to a decision on how the funding should be allocated. However, it should be stressed that the recommendations made by British Gas within this document are designed only for guidance, and it is ultimately the decision of Tackley project leaders and their community as to how the funding is allocated and on what measures it is spent.

2 Key Considerations

This report contains a large amount of information that is designed to help you come to a decision as to where to allocate your funds. We understand that this may be a difficult decision to make, which is why your Community Project Manager will be on hand to help you through this document. In addition to this, please take note of the contents of this section as each of the considerations outlined may be things you'd like to take into account when interpreting this report.

The Energy Saving Hierarchy

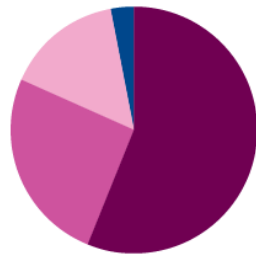
It is generally accepted that there are three key steps that a household should take to reduce their energy consumption and carbon emissions. These steps should be followed in order and are:

- 1) **Be “lean”** – The first step is to do everything possible to cut the energy waste from your current lifestyle. These consist of all the behavioural steps that have no costs at all. Examples include reducing the heating times or lowering the thermostat.
- 2) **Be “mean”** – The next step is to make investments in your property that cut down your overall demand for energy. These include measures like insulation which help increase the environmental performance of the building itself.
- 3) **Be “clean”** – The final step in the journey is to offset as much of your remaining energy consumption with renewable energy systems as possible. It is important that you minimise your energy requirements first since the renewable energy you generate is so valuable that you wouldn't want to waste any of it unnecessarily.

The recommendations in this report are placed in the order in which they should be taken up. If you follow this advice, it will ensure that you maximise the possible energy and carbon savings while minimising the cost.

Energy Consumption in UK Homes

Over three-quarters of the energy we use in our homes is for heating



- Heating homes 57%
- Heating water 25%
- Appliances & lights 15%
- Cooking 3%

Source: Department of Energy and Climate Change, Energy Trends (September 2008)

The average household in the UK consumes around 3,300kWh of electricity for use in lighting and appliances and around 20,500kWh of gas for heating, hot water and cooking. This equates to an annual energy bill of around £428 for electricity and £779 for gas (around 75% of UK homes are heated with gas). The carbon emissions from such a household would be around 5.97 tonnes per year.

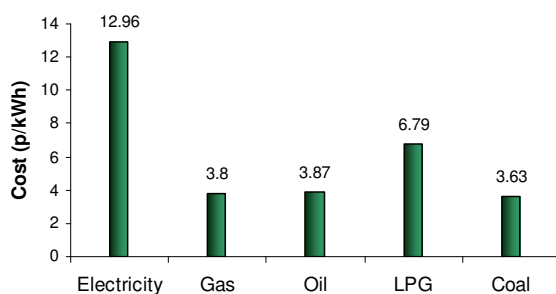
One of the key focus areas that the British Gas Green Streets programme seeks to promote is saving energy – particularly in the home. The pie-chart to the left clearly shows that the potential for overall energy savings are higher in reducing heating and hot water demands. You should bear this in mind when making your investment decisions, as you may find it easier to reduce your heating demand, and therefore contend for the final prize.

This being said, there is a significant difference in the amount of energy that we use in our homes. The energy usage, cost and carbon emissions figures quoted above should therefore be considered as broad averages. In reality costs and carbon emissions vary greatly from house to house. This is largely due to differences in fuels used, the construction of the house and the lifestyles of the inhabitants. This information could help you to prioritise which households receive measures.

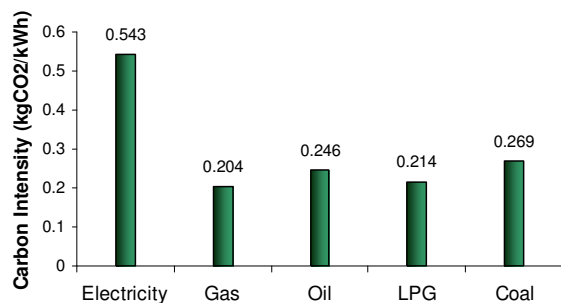
Cost & Carbon Intensity of Fuels

The graphs below highlight just how different the cost and carbon intensity of different fuels can be. We can see, for example, that electricity is over 300% more expensive than gas, oil and coal and nearly twice as expensive as LPG (due to the inefficiency of the generation and transportation process). Therefore, for households heated by electricity, the financial benefits of energy efficiency and renewable technologies are significantly larger than for gas heated homes.

The average cost of domestic fuels in the UK



The average carbon emissions of domestic fuels in the UK



Similarly, you can see from the graph on the left that electricity is also the most carbon intense of the fuels – emitting over twice as much carbon dioxide than any other fuel. In addition, we can see here that the environmental benefits of installing energy efficiency and

renewable technologies into oil-, LPG- or coal-heated homes is far better than in gas-heated homes.

Fuel Type	Number	
Gas	62	Your participants predominantly use gas to heat their homes. It would be a good idea to consider the additional carbon and cost-saving benefits that you might achieve by focusing on your oil, coal and electricity users first.
Oil	5	
LPG	0	
Coal / Solid Fossil Fuel	0	
Electricity	5	

Housing Stock Profile

When considering the impact that the housing stock in your area might have on energy demand, there are two key things to consider:

The Age of the Property – Building regulations were updated regularly through the second half of the 20th century to progressively increase the minimum energy efficiency standard for properties built at the time. For properties that pre-date the 1930s, poorer construction techniques and a lack of modern materials mean that they tend to leak energy at a far greater rate than more modern homes. This makes them prime candidates for “retro-fitted” energy efficiency measures.

Age of House	Number
Pre 1900	19
1900-1929	5
1930-1949	4
1950-1965	13
1966-1976	10
1977-1981	3
1982-1990	6
1991-2002	4
Post 2002	4

Your community is over represented by older properties, with 26% of your participants identifying their property as pre-dating 1900. Energy efficiency (particularly heat-saving) measures could generate large energy savings in these properties.

Type of Property – Detached properties will tend to be larger in size. They also tend to lose heat to the outside considerably faster than semi-detached and terraced houses, given that they have more external walls. Generally, it will be more cost-effective to install energy

Type of Property	Number
Flat	0
Terraced	15
Semi-detached	15
Detached	33

saving measures in the larger, detached homes for this reason. Detached properties are likely to have larger roof-tops, with less shading too – making solar technologies a possibility.

Your participating households are over represented by detached houses, and there are no flats. This also means that encouraging good energy saving behaviours in your properties is likely to save disproportionately more energy than the national average.

Resident Profile

It is important to consider the profile of the residents within a household, as this can have a significant bearing on their overall energy consumption, as well as which energy saving measures could be most appropriate. One key determinant of likely energy demand is employment status. If there is a retired, unemployed or part-time worker residing in the property, then it is likely that the property is in occupied for a greater proportion of the day.

Employment Status	Number	
Full Time Employed	44	For this reason, a small home with one or two full time workers is likely to have lower energy consumption than, say a retired couple who may spend more time in the house, and therefore use their central heating, or televisions for longer.
Part Time Employed	7	
Self Employed	4	
Unemployed	0	
Retired	17	

Also, it is worth considering the implications of choosing to install measures into a rented property. This will require prior agreement from the landlord in advance of any works taking place. A vast majority of your participants are owner-occupiers, so this may not be too much of a problem.

Type of Property	Number
Private Rented	8
Housing Authority / Council	1
Owner Occupier	63

In addition, the number in each property is a key factor that determines the energy usage within a property. It also has a bearing on which measures to consider. For example, a high occupancy home will probably require more electricity for lighting and appliances as people make use of the full space of the house. Low energy lighting and good electricity saving behaviours will therefore generate more savings than if the property had fewer inhabitants.

Occupants	Number
1	7
2	26
3	15
4	13
5	7
6	2
7+	0

Similarly a property that only has one or two individuals may benefit more from a more efficient boiler and controls system. This will better allow them to heat only the parts of the house that are most used and only at a time when someone is in.

The occupancy rate of your participants is higher than the national average – in some cases by a significant amount. In these cases, it is also worth bearing in mind that there will be a higher hot water demand than normal, which makes the case for installing solar thermal panels more compelling.

Note on Savings & Costs Figures

All savings figures in the main body of the report are based on evidence from The Energy Saving Trust, OFGEM, Act on CO₂ data or independent product testing figures provided by the manufacturer. They refer to the typical savings that an average 3-bedroom, gas-heated property could make, unless otherwise stated.

The prices quoted for the lower cost measures are based on our standard retail price per unit. The costs provided for larger measures are for guidance purposes only and are based on the average price of a standard installation; these prices may vary on a property by property basis and will be dependant on the scale of the installation. At this stage, we would recommend you use the figures quoted to assist in budgeting for which houses will receive which measures, before working with your Community Project Manager to finalise your budget and arrange any subsequent assessments that may be required.

We appreciate that there are energy-saving behavioural changes and alternative energy saving measures that this document may not cover. However, should you have identified any specific measures or behavioural changes that you feel you would like to introduce to your community, please feel free to discuss with your Community Project Manager the possibility of incorporating these into your project.

3 Summary of Recommendations

Measure	Volume	Budget cost	Recommendation	Notes
Energy Saving Light Bulbs	1179	£3,610	Highly recommended	This includes a number of different styles and fitting types
Cavity Wall & Loft Insulation	27	£6,849	Highly recommended	Includes 7 cavity wall and 20 loft top-ups
Radiator panels	591	£2,364	Highly recommended	
Standby Savers	100	£1,999	Recommended	Your community would benefit from these, but same results could be achieved with behaviour change
ECO Kettles	49	£1,470	For consideration	Your community would benefit from these, but same results could be achieved with behaviour change
Boilers & Controls	9	£31,500	Highly recommended	There are 9 boilers to replace as a priority. However, you may consider replacing other boilers close to the end of their lifetime
Double glazing	118	NA	For consideration	All single glazing is in 12 properties. It may be that alternatives to full double glazing replacement could be appropriate
Solid wall Insulation	32	£272,000 (min) £464,000 (max)	Recommended	Opportunities to minimise disruption if a participant is planning to redecorate. You also may wish to consider only treating one or two walls, rather than the whole house

Total Cost (min)	£319,792	Minimum budget cost, assuming all measures adopted
Total Cost (max)	£511,792	Maximum budget cost, assuming all measures adopted

The overall performance of the domestic energy generating equipment that we have identified is very dependent on the circumstances of each property. Therefore it is not possible to recommend one specific technology over another. However, as a general rule, you should attempt to install as much of the energy efficiency measures as possible in a home before considering renewable energy systems. Additional guidance is provided in section 6.

4 Low Cost Energy Efficiency Measures

Ambient Temperatures & Heating Times

Energy Saving Light Bulbs

Cavity Wall & Loft Insulation

Radiator Panels

Cylinder Jackets & Pipe Lagging

Electricity Monitors

Standby Savers

Eco Kettles

Ambient Temperatures & Heating Times

The temperature at which you keep your home makes a significant difference to your energy bills. It is widely accepted that for every 1 degree that you lower the temperature in your home, you will reduce your heating bills by approximately 10%. Most households set their heat at between 19 – 21 degrees Celsius.

Room Thermostat Setting

Room Thermostat Setting	Number
Less than 19C (66F)	16
19C (66F)	10
20C (68F)	18
21C (70F)	12
22C (72F)	0
23C (74F)	0
More than 23C (73F)	0

Of all the gas users, we found that all the house holds already have their thermostat set within the normal range.

Setting the heating times correctly is a very easy way to save energy. 5 households were found to have the heating on all day and all night. The energy experts gave advice on how to set the heating times to correspond with the times that residents are in the home and need the heating on. As a community group, you should reinforce this message further with your participants as it is often underestimated how big of an impact correctly set heating times can have on energy usage.

Energy Saving Light Bulbs

Replacing old-fashioned incandescent bulbs or halogen lamps with new energy saving alternatives is a simple and very cost effective energy saving measure. Typically, one can expect to reduce the amount of electricity required for lighting by 40% to 80%.

Although energy saving light bulbs is a little more expensive than regular bulbs, nearly all have a payback period of 1-2 years, and a lifetime of up to eight times longer than their incandescent counterpart.

We have identified 180 light fittings within the households of your project that are currently fitted with non energy saving light bulbs. A suite of energy saving alternatives is recommended in Annex 1.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
1179 Energy Saving Light Bulbs	£3610	39,910	21,671	£5,172	6 – 8 (approx)

Cavity Wall & Loft Insulation

Insulation is the best thermal improvement that you can make to a property. It is without doubt the most important energy saving home improvement that a householder can make. This is why the government plans to have every possible cavity wall and loft in the UK insulated by 2015.

Thanks to the Government Carbon Emissions Reduction Targets scheme (CERT), both cavity wall and loft insulation can be offered at significantly subsidized costs, making these measures extremely cost effective too. For this reason we strongly recommend that you take all of the cavity wall and loft insulation measures that we have identified.

The technical surveys that we performed on your participating households identified that 7 properties could be fitted with cavity wall insulation and 20 properties could benefit from a top-up to their existing loft insulation to within the recommended range of between 250mm to 300mm thick.

The Energy Savings Trust estimates that a typical three bedroom semi-detached property stands to save around £115 and 610kg of carbon dioxide per year by installing cavity wall insulation. Savings from topping up loft insulation stand at around £45 and 230kg carbon dioxide per year. See Annex 2 for details.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
7 Cavity Wall Insulation	£6849 (total)	20,930	4,270	£805	25 years (guaranteed)

20 Loft Top-ups		21,643	4,600	£900	25 years
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Radiator Panels

A significant proportion of the heat from a typical radiator goes into heating the wall behind. This is a problem when the radiator is attached to one of the external walls of a property, as it means the heat conducts through the wall and out of the house.

Radiator panels help to minimize this problem in two ways. Firstly, the reflective surface directs heat (specifically infra-red heat) back into the centre of the room. Secondly, its saw-tooth design increases turbulent convection of warm air from behind the radiator and into the centre of the room.

Independent trials have shown that energy savings for space heating can be as much as 20%. The products offered by British Gas are also recognized by OFGEM as contributing to the UK Carbon Emissions Reduction Targets.

Our energy assessments show that your community requires 591 radiator panels to treat all radiators on external walls. To review which properties require radiator panels, please see Annex 3.

The unit price for radiator panels is £4 each. A typical radiator is likely to need 2 – 3 panels. They save approximately 10kg of carbon dioxide per panel per year, as well as 49kWh of heating fuel.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
591 Heatkeeper™ Radiator Panels	£2,364	28,959	5,910	£1,099	10 +

Cylinder Jackets & Pipe Lagging

A cylinder jacket is a simple and easy way to save energy and money - it could pay for itself within six months. By ensuring that your hot water cylinder is insulated with at least a 75mm thick jacket, the heat loss can be reduced by up to 75%. It could save around £35, 900kWh and 195kg of carbon dioxide per year.

Lagging the primary pipe-work in your home is a low-cost measure that can improve energy efficiency as well as convenience. Not only does it stand to save around £10 per year and

around 200kWh of energy, but it will also mean that your hot taps should require less running before they reach the desired temperature.

We have identified that 4 of your households could benefit from a new cylinder jacket and 1 of your households could make use of pipe lagging (See Annex 3). Both these measure will require some very basic DIY measures to fit, but we recommend that you endeavor to fit all of these measures, since they payback the initial cost in energy savings very quickly indeed.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
4 Cylinder Jackets	£53.96	3,600	780	£140	10
10 meters of pipe Lagging	£6	526	107	£20	10

Electricity Monitors

An Electricity Monitor provides a householder with a real time estimate of your energy consumption. It does this by monitoring the amount of electricity that enters the home at the electricity meter and then wirelessly sending this data in real time to a display device (pictured).

The display device can be conveniently placed in a prominent area of home so that the householder can always see how much electricity they are using at that moment.

Although the electricity monitor does not save energy in of itself, it has been shown to stimulate energy saving behaviours in householders by clearly showing what activities consume the most electricity. By encouraging energy saving behaviour, energy monitors could save around £20 per year, which equates to around 150kWh of electricity or 64kg of carbon dioxide.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
Electricity Monitors	£34.99	150	64	£20	5

Standby Savers

We all know that leaving appliances on standby uses energy unnecessarily. Despite this, homes in the UK continue to waste around £800 million per year on electricity costs by leaving appliances on standby, or not switching them off from the wall – according to “Act on CO₂”.

The main culprits for this tend to be TVs and PCs, along with their related peripherals – such as set-top boxes, speakers and DVD players. Standby Savers from British Gas can help a householder to eliminate this waste simply and effectively.

The Standby Saver has some intelligent electronics within it, which enable it to automatically cut the power to all appliances plugged into it when either the standby button is pressed on the TV remote control, or when the PC is powered down.

The unit price for the Standby Savers is £19.99. On average, they should save £30 per year, 231kWh of electricity and 126kg of carbon dioxide. We found that 60 of your participating households could benefit from a TV standby saver and 40 could make good use of a PC standby saver. Further details can be found in Annex 3.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
60 TV Standby Savers	£1,199	13,889	7,542	£1,800	5 years
40 PC Standby Savers	£800	9,259	5,028	£1,200	5 years

ECO Kettles

Boiling more water than is needed in a kettle wastes a lot of energy, time and money. Simply encouraging people to only fill the kettle up with as much water as they need could save on electricity bills. The Eco Kettle can help with this by allowing the user to conveniently and precisely measure out the amount of water to be boiled, using its specially designed “reservoir”.

The Energy Saving Trust found this product to reduce the electricity used to boiler water by 30% during scientific testing. The unit price for the Eco Kettle is £29.99. It could save around 54 kWh of electricity per year, which is equivalent to 29kg of carbon dioxide per year.

Product Recommendation Summary	Cost (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
49 Eco Kettles	£1469	2,647	1,437	£343	3 – 4 years

5 High Cost Energy Efficiency Measures

Boilers & Controls

Double Glazing

Solid Wall Insulation

Boilers & Controls

The majority of households are heated by gas boilers and radiators (62) or oil boilers and radiators (5) with only 5 properties with electrical heating.

Boiler Age	Number	
0 - 5 years	30	For those properties heated by gas and oil, 50 (74%) have been installed since 1995 and 40 (59%) since the turn of the millennium. New condensing boilers tend to be more energy efficient than their older, non-condensing equivalents – so it is preferable to have a newer A-rated boiler installed in the place of older boilers.
6 - 10 years	10	
11 - 15 years	10	
16 - 20 years	4	
20 + years	5	
Don't know	0	

Condensing boilers became the standard from 2005 onwards, due to a tightening of building regulations. However, we would not recommend replacing boilers younger than 10 years old. We would, however, strongly recommend that any boiler over 15 years old be replaced as a priority. You may wish to consider replacing boilers that are between 10 and 15 years old too, although this would be a secondary concern.

New boilers will be supplied with upgraded controls. The Energy Saving Trust estimates that upgrading to a condensing boiler and full controls should save the average household up to £235 and 1,300kg of carbon dioxide per year.

Please note that in order to determine the actual costs for each boiler replacement, a fully qualified British Gas heating surveyor will need to assess the existing system and generate a quote. Therefore the budget proposal figures below should be viewed as indicative at this stage, and could go up or down. Details of eligible households are given in Annex 4.

Product Recommendation Summary	Proposed Budget (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO₂/year)	Financial Savings (£/year)	Product Lifetime (years)
Upgrade Standard Gas Boiler older than 15 years (x9)	£3,500 /unit	7,630 /unit	1,300 /unit	£235 /unit	15

Double Glazing

We surveyed 857 windows in total and found that a commendable 86.2% of these were double glazed. This double glazing could be saving these properties around £135 and 720kg of carbon dioxide per year compared to single glazing.

Of the 118 single glazed windows we found, they were all concentrated within 12 properties. These properties had no double glazing at all, and so could suffer from high heat loss, cold spots and condensation within the property.

Double glazing is an expensive measure, which will require a glazing specialist to provide a bespoke survey and quote. Unfortunately British Gas is unable to offer double glazing, as it is outside of our current expertise. However, there are a number of alternative methods for treating single glazed windows. If you are interested in pursuing any of these treatments further then your CPM will be on hand to advise.

Annex 5 shows the three properties that could benefit from double glazing.

Solid Wall Insulation

32 properties were identified as being constructed from solid walls and having no remedial insulation measures since their construction. Typically, around 45% of heat loss in these homes will be directly through the solid walls. This means that the savings that can be generated from solid wall insulation can be staggeringly high.

However, the level of effort and disruption required to install solid wall insulation should not be underestimated. It will require a follow-up bespoke solid wall assessment from a product specialist. The household must also be prepared for significant disruption to their property. For example, external solid wall insulation will require the outside of the building to be completely re-rendered or clad in insulating board. Internal solid wall insulation will involve cladding to be added to the walls on the inside of the home – therefore requiring redecorating and potentially some loss of space in the rooms.

That being said, if a property is difficult to keep warm in the winter this may cause a health hazard for more vulnerable householders and solid wall insulation may be one of the only measures that can solve this problem. In addition, it is possible to treat only one or two walls of the home, which may help to minimize cost, disruption affect on the building appearance. Details of the properties that should be considered for further investigation are in Annex 6.

Product Recommendation Summary	Proposed Budget (£)	Energy Savings (kWh/year)	Carbon Savings (kgCO ₂ /year)	Financial Savings (£/year)	Product Lifetime (years)
Internal Solid Wall Insulation	£5,500 - £8,500	10,000	2,000kg	£380	15+
External Solid Wall Insulation	£10,500 - £14,500	10,500	2,100kg	£400	15+

6 Domestic Renewable Energy Technologies

Solar Photovoltaic Panels

Solar Thermal Panels

Mast Mounted Wind Turbines

Ground Source Heat Pumps

Air Source Heat Pumps

Biomass Boilers

Biomass Stoves

Solar Photovoltaic Panels

A remarkable 37 out of the 72 properties surveyed were found to have some level of potential for generating electricity from solar energy. These properties were found to have areas of un-shaded roof, optimally oriented for Solar PV panels – facing between south east and south west. There were also at least 6m² of space on which to site the panels.

34 properties were found to have at least 10m² of space on the roof and 24 directly facing south. Since larger Solar PV systems are much more cost-effective, we recommend that larger systems are installed on these larger roof-tops - particularly if your group wishes to maximise carbon savings and renewable energy generation with a given amount of funds.

Therefore, while it could be feasible to progress to technical surveys on all 37 properties, we would recommend that the 24 roof-tops of at least 10m² of space *and* facing due south are investigated as a priority. Details can be found in Annex 7.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Clean Energy Cashback (£/year)	Electricity Bill Savings (£/year)	Product Lifetime (years)
2.1kW Solar Photovoltaic Panels	£11,900	1,785	969	£737	£160	25

Solar Thermal Panels

Solar Thermal systems require a hot water tank that is typically at least 50% larger than a standard tank. In addition, combination boiler systems are not compatible with solar thermal systems. Households that do not fall within these criteria have therefore been excluded.

While it is not absolutely necessary, we would also strongly recommend that Solar Thermal panels are installed in properties that have a larger number of inhabitants. For dwellings that are occupied by three or fewer individuals, the demand for hot water will fall well below the system's capability, thus reducing the amount of useful energy provided by the system.

Therefore, despite the large proportion of roof-tops that are suitably oriented and sized for Solar Thermal installations, it was found that only 12 of the 72 properties would receive the maximum benefits of such a system, given the considerations above. Details can be found in Annex 8.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Renewable Heat Incentive (£/year)	Gas Bill Savings (£/year)	Product Lifetime (years)
2.5kW Solar Thermal Panels	~£5000	1375	280	£250	£40	25

Mast Mounted Wind Turbines

The performance of domestic wind turbines are highly site specific. In order to get the most out of a system it is best placed on mast that is taller than any nearby obstacle and as far away from any obstruction as possible. Generally speaking, for the best wind resource and the simplest planning process, rural sites are also recommended.

Our surveys found that there may be an opportunity for 6 of your participants to install a small, mast mounted wind turbine, as they have access to a large area of un-obscured land. Details can be found in Annex 9.

A review of the NOABL online wind speed database shows that the Tackley area receives average wind speeds of around 5.7m/s. This is above the minimum recommendation of 5m/s. Therefore, we strongly recommend further wind resource analysis at the sites could be worth while.

We also recommend that priority for wind installations is given to those using electricity to heat their home or hot water. This will maximise financial and carbon savings.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Clean Energy Cashback (£/year)	Electricity Bill Savings (£/year)	Product Lifetime (years)
Proven (2.5kW) Wind Turbine	£18,000	3,285	1784	£871	£295	20

*Assumed load factor of 15%

Ground Source Heat Pumps

A total of 7 participants could find that a GSHP system could be suitable for their property. The key criteria that are considered when assessing the opportunity for GSHPs are:

- The householder has a large area of open ground under which to site a ground loop
- The householder is prepared to have this area dug to a depth of up to 2 metres
- There is sufficient access to this space for a digging machine

In addition, we would recommend that the householders should only go ahead with a GSHP installation if they have a well insulated house and are prepared to install larger radiators or under floor heating. We would also caution those with gas heating that the costs of heating their house may increase by installing a GSHP.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Renewable Heat Incentive (£/year)	Annual Running Cost (£/year)	Product Lifetime (years)
Ground Source Heat Pump System (assumed to deliver 17,500kWh)	£7,000 - £13,000	17,500	0kg (vs. gas) 540kg (vs. oil) 5600kg (vs. solid fossil fuel)	£1225	£600	23

Air Source Heat Pumps

Participants require an area of ground outside their property, close to the external walls, on which to site the external components of an ASHP system. In addition, since ASHPs tend to be less efficient than GSHPs overall, they are not able to compete against gas heated properties on energy costs or carbon savings at this time.

We identified 59 properties that fitted our pre-feasibility criteria for ASHP systems. Only 8 of these 59 do not use gas, 5 of these currently use electricity to heat their homes. These individuals could see significant cost and carbon reductions. However, since they will not have an existing radiator system, they will require significant internal works in order to take this measure – which may increase costs. Details of the relevant properties are in Annex 11.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Renewable Heat Incentive (£/year)	Annual Running Cost (£/year)	Product Lifetime (years)
Air Source Heat Pump System (assumed to deliver 17,500kWh)	£5,000 - £9,000 (excl. internal works)	17,500	0kg (vs. oil) 4600kg (vs. solid fossil fuel) 5000kg (vs. electric)	£1312	£908	23

Biomass Boilers

A reasonable amount of space is required within a property if it is to have a biomass boiler system. This is in part due to the fact that the boiler itself is slightly larger than a conventional

gas or oil boiler, but also because a significant area is required to store the wood pellet fuel (around 1.5m x 1.5m x 1.5m). Therefore properties with utility rooms, garages or out buildings are most suitable.

In addition to that we have also reviewed every property to determine whether there is adequate access for delivery vehicles. We found 5 properties within your community that met with these requirements. Their details can be found in Annex 12.

If you decide to investigate biomass boiler installations further, you should also consider the following:

- Running costs will be higher than a gas boiler until the government incentive scheme begins in April 2011
- Highest carbon savings can be achieved when switching from electric heating to biomass. However, a whole new central heating system will also be required
- You should ensure that there is a reliable local supplier of wood fuel in advance
- The householder should be prepared to empty the system of ash every month and arrange fuel deliveries up to 6 times per year
- Larger properties with higher heat demand could be more cost-effective

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Renewable Heat Incentive (£/year)	Annual Running Cost (£/year)	Product Lifetime (years)
Biomass boiler system (excl. flue & heating system upgrade)	~£9,000	25,000	~4,000kg (gas, oil, lpg) ~5,500kg (vs. solid fossil fuel) 10,800kg (vs. electric)	£2,250	£1,700	23

Biomass Stoves

For homes with a reasonable sized chimney, or that are willing to install a flue, a simple wood-burning stove could be a good choice to reduce carbon emissions. Stoves tend to be significantly more efficient at delivering the heat from burning wood directly into the room, as opposed to open fires, where much of the heat escapes straight up the chimney.

These are particularly useful if the householder spends a large amount of time in the living room during the winter. A stove will allow them to heat up just this room, rather than having the central heating system heat up the whole house.

We have identified that 26 properties might benefit from a biomass stove. It will be difficult to determine the financial, carbon and energy savings associated with having a stove installed, since it is heavily dependent on how the householder uses it, where they source their wood from and what heating fuel they are displacing. The figures below assume that the stove is used for 4 hours per day during the winter, and 2 hours per day during late autumn and early spring. Annex 12 contains more details.

Product Recommendation Summary	Proposed Budget (£)	Energy Generated (kWh/year)	Carbon Savings (kgCO ₂ /year)	Renewable Heat Incentive (£/year)	Annual Running Cost (£/year)	Product Lifetime (years)
Biomass Stove in living room	~£3,000 (fully installed)	~2,000 (depends on usage)	390kg (vs. gas) 465kg (vs. oil) 500kg (vs. coal)	N/A	Depends on wood source	25