OxFutures

Energy Saving Recommendations Report

for

The Abbey, Sutton Courtenay

15/8/2017

OXFORD BROOKES UNIVERSITY

European Union

European Regional Development Fund

ORGANISATION OVERVIEW

Report overview

EiE carried out a site visit and interviewed Linda Hull, Calum, Dylan, Jackie and Wendy. All recommendations in this report are based on information and observations obtained during the site visit and information subsequently provided by Linda. The opportunities are presented in order of priority based on ease of implementation, carbon impact, cost and others factors discussed.

Client details

Organisation name	The Abbey, Sutton Courtenay	The Green Sutton Courtenay Abingdon Oxon OX14 4AF
Contact name	Linda Hull	linda@theabbey.uk.com 07772 655035
Date of site visit	15/8/2017	Carried out by Moira Dorey

Energy savings recommendations - summary

Below is a summary of the opportunities recommended in this report. Costs and savings have been estimated using available information; an explanation is provided in detail for each opportunity. Estimations have been made based on energy data provided. Where savings estimations are not given further details/surveys would be required.

Opportunity	Cost (£)	Savings (kWh) / yr	Savings (£) / yr	Savings (tCO_2e) / yr	Initial payback
Improve billing accuracy	0	0	1625	0	N/A
Match heating times to building occupancy	0	15619	662	2.87	N/A
Add insulation	2270	5087	585	2.10	3.9 yrs
Add draught proofing to external doors	10	149	14	0.06	9 mths
Power down or switch off appliances	8	175	20	0.07	5 mths
Upgrade lighting to LEDs	115	1887	217	0.78	6 mths
Add lining to curtains	300	743	68	0.31	4.4 yrs
Install electric wall-mounted heaters	2500	5492	276	2.26	9.1 yrs
Add internal wall insulation	201	522	60	0.22	3.4 yrs
Repair/replace double glazing	-	-	-	-	-
Replace gas boiler	1500	10162	220	1.87	6.8 yrs
Consider adding solar PV panels	12600	5838	748	2.41	16.8 yrs
Consider adding solar thermal panels	5000	4826	550	1.99	9 yrs
Consider adding air source heat pump	9000	4100	922	1.69	9.8 yrs
TOTAL	**£33 504**	**54 600 kWh/yr**	**£5967/yr**	**16.63 tCO_2e /yr**	

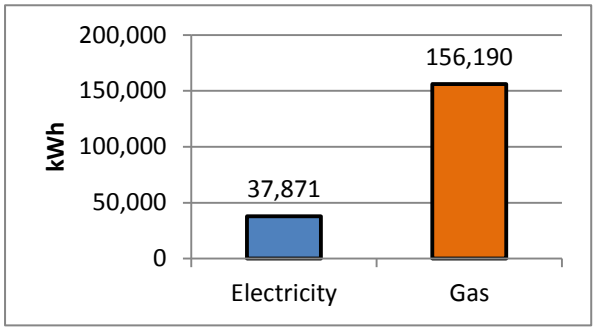
Site details

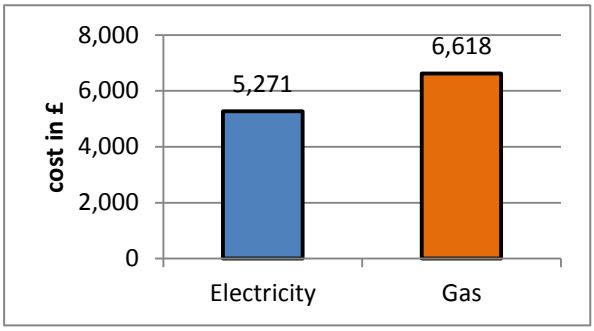
The Main House (The Abbey) was built between early to mid-1200s and late 1400s. The area is 800 m² over 2 floors plus attic rooms. The building is heated by a gas central heating system with 3 boilers. The Guest House was converted into a habitable building in the 1980s; it is 180 m² in area and a single storey. The Guest House is not connected to gas mains and is heated by night storage heaters and oil filled stand-alone radiators.

ENERGY PROFILE

Energy consumption annual profile			
Fuel type	**Annual Energy use kWh**	**Cost per kWh (p)**	**Approx. annual cost excluding VAT**
Electricity	37871	11.5p/day 7.06p/night	£5271
Gas	156190	2.165p	£6618

Energy profile breakdown for The Abbey- consumption (left) and costs (right)

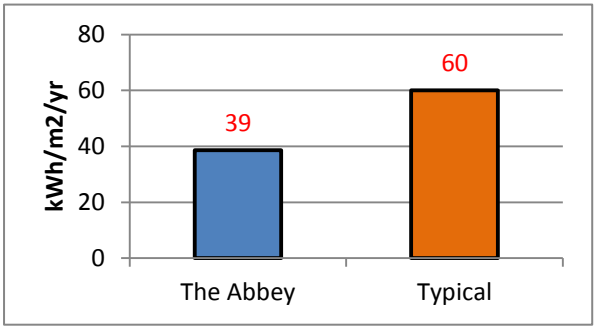


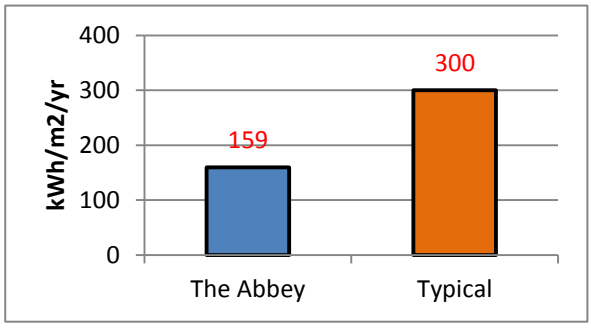


Consumption is based on usage figures from January to December 2016 with some adjustment for adjusted billing.

Energy benchmarking		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
50 500	**5045**	**24 504**

Consumption benchmarks by fuel type





Electricity

Gas

Bar graph of fuel sources by kWh per m^2 actual compared to typical values

Benchmarks are based on typical use for general accommodation using data provided and compared to CIBSE figures.

Improve billing accuracy		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
N/A	**1625**	**0**

The majority of your bills are based on estimated readings. While some bills include VAT at 5%, others are showing VAT at 20% with different VAT rates charged from what appears to be the same meter. Financial savings can be made by improving the accuracy of your energy billing. Savings can be used to fund energy efficiency measures.

Additionally, due to changes made in the 1970s, there are 5 electricity meters and 4 gas meters serving the main building, all of which attract a separate standing charge. Energy costs could be reduced by reducing the number of meters.

Actions

Contact your energy broker to discuss whether they can explain/adjust the anomaly in VAT rates. Incorrect VAT rate rebates can be backdated for 3 years. Aim for 5% VAT for the main house. You may have to pay 20% VAT on the guest house bills.

Arrange for meters to be read at the end of each month and call the meter readings through to your energy suppliers to ensure accurate billing. This will both allow you to budget for energy use more accurately and, by recording energy usage, identify when energy usage is uncommonly high or savings have been made.

Contact your electricity provider, Scottish and Southern Energy Power Distribution on 0345 026 2554, and gas provider SGN on 0800 912 1700, to discuss reducing the number of meters that you have on site for both electricity and gas down to one each in the main building. This will reduce the standing charges and the amount of time it takes to read the meters. Additionally, discuss with them whether they could also install 'smart' meters on your site which will send reading direct to the energy supplier. There may be a charge for smart meter installation.

Savings calculations

Based on reducing 5 electricity meters to one at an average standing charge of £95/year = £380

Based on reducing 4 gas meters to one at an average standing charge of £415/year = £1245

ENERGY SAVINGS OPPORTUNITIES

Match heating times to building occupancy		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
15619	**662**	**0**

The radiator in the library was giving off heat during the audit visit and it was reported that the dining room radiators had been on the previous week. Heating is not required in the building during summer months.

Energy is wasted if heating times do not match building occupancy, radiators and hot water are on unnecessarily or the temperature is set too hot. Matching heating times and temperatures to occupancy will reduce energy usage and costs and enhance comfort levels.

Actions

Re-programme your heating to 'off' during summer months. There is normally no need to heat a buiding from early May to late September. If the heating settings on the boilers are set to off during this period there is no chance of radiators being turned on accidentally. If you do not know how to operate the programmer for the heating, user instructions can normally be found on the internet or consult your electrician.

If hot water is not required overnight (e.g. 11pm to 6am) hot water can be programmed to be off during these hours in both the main house and guest house. To maximise energy efficiency, hot water tanks surrounded by a thick blanket of insulation will retain heat longer, saving energy. Check all hot water tanks and top up insulation as required.

Savings calculations

Savings calculations are based on reducing the heating being on when it does not need to be by 10% of the time that accounts for unnecessary summer heating.

Add insulation

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
10174	**1170**	**2270**

Both Calum and Linda reported that there is only about 50mm of insulation in the loft above the guest house ceiling and that it is patchy and poorly laid.
Additionally, it is thought that there is no insulation above the pitched ceiling in the guest house living room.
Lastly, there is very little insulation in the loft above the ceiling in the main house and what is there is reported to be old.
Up to 25% of your building's heat is lost through the roof if it is un-insulated. Increasing insulation up to 300mm will minimize heat losses in winter, reduced heat gains in summer, improve comfort levels for users and reduce annual energy bills by reducing heating requirements.

Action

Loft Insulation - Mineral wool insulation should be installed to a recommended level of 300mm to maximise heat retention in the building. Mineral wool insulation is readily available at DIY shops and costs of installation can be reduced by using volunteers to carry out this work. It is recommended that 100mm is laid as a bottom layer with 200mm top-up laid at right angles to the bottom layer to avoid gaps in the insulation. Ensure insulation is installed right to the edges of the roof space.
Pitched ceiling Insulation - In order to retain the open ceiling rafters, a 37mm thickness attached with direct bonding (dot and dab) needs to be added as this will allow the insulation boards to slot under the current rafters. Thinner insulation is available if an accurate measurement shows that the space between the rafters and the ceiling is less that 37mm. The cost of insulating this ceiling is reduced in a volunteer carries out the work. For an example of thermal laminate insulation see:
http://www.insulationgiant.co.uk/Celotex-Insulation-PL4025-Thermal-Laminate-25mm-Plus-12-5mm-2400mm-x-1200mm-/p/778056
Main house loft insulation - a thorough check is required to establish insulation requirements for this loft. Once condition is known, calculations can be based on the calculation for the guest house.
If this work is to be carried out in 2 stages it is recommended that guest house loft insulation is added as soon as possible.

Savings calculations

Cost:

Loft Insulation for 161.2m2
16 rolls of 100mm bottom layer Coverage 11.08m2 @ £20/roll =£320
30 rolls of 200mm top layer laid at right angles to bottom layer Coverage 5.61m2 @ £20/roll = £600
Total cost £920 plus fitting

Pitched Ceiling for 97m2
97 x £10.73/sq m + VAT = £1250 plus plaster, paint etc. = £1350. Total Cost of roof insulation = £2270

Main house loft insulation

Further details of size and current condition of insulation would need to be provided before savings calculations could be made for this area.

Saving:

The above savings are calculated Insulation savings for above ceiling and pitched roof based on Energy Saving Trust estimates adjusted for electric heating.

Add draught proofing to external doors		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
149	**14**	**10**

There were gaps visible around external doors in the guest house. Heat will escape in winter through any gaps around the door; draught proofing will greatly reduce this and improve comfort levels in the building.
The best way to determine if draught proofing is required on a door is to feel around the door when the heating is on and it is cold outside when draughts will be very evident and remedial action can be taken.

An example of draught stripping can be found online here: http://www.screwfix.com/p/stormguard-door-window-strips-brown-1-05m-5-pack/35308.

Actions
Add draught stripping to the door or door frame. If draught stripping is not suitable to attach (e.g. if the gap is not uniform), consider engaging a contractor to suggest improvements to the door frame.
Draught stripping is available from DIY stores and is easily applied by a volunteer.

Savings calculations
Cost:
A pack of 5 x 1m heavy duty around-door strips are approximately £10 and could be attached by a volunteer.
Saving:
Reduce heat loss by 1% by reducing draughts.
Guest House annual electricity use £2704/ 29708 kWh. Savings assume 50% of this figure is on heating.

Power down or switch off appliances when not in use		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
175	**20**	**8**

Your photocopier in the main house was identified as being switched on ready for immediate use when not needed, particularly overnight. Powering office equipment when not needed wastes energy.

The Carbon Trust estimates that office energy use could be reduced by a minimum of 5% by powering down and switching off office equipment and appliances when they are not needed.

Reducing the time equipment is on can prolong its useful life. More information is here: https://www.carbontrust.com/media/13113/ctv005_office_equipment.pdf.

Actions

Carry out a review of your photocopier instruction manual or talk to the manufacturer to establish the following:
- What is the energy use of the item in operational, stand-by and sleep modes?
- Does it automatically go into low energy mode when standing idle?
- Can it be programmed to switch off using a timer at the plug socket?

Discuss with staff that use the photocopier when it needs to be on. This will help establish when it can be switched off without causing disruption.
Purchase and install a 7-day plug socket timer to turn the machine off overnight.
Set controls for optimal energy efficiency, for example, setting 'power down' mode etc.
Carry out checks to ensure that equipment is turned off as expected.

Savings calculations

Cost: A 7 day plug socket timer costs about £8
Saving: Saving of 8 hours a night, 7 days a week at 60W/hour (in stand-by) = 175kW x 11.5p = £20

Upgrade lighting to LEDs

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
1884	**217**	**115**

Lights currently installed in the guest house are traditional 60W bulbs. There is a single fluorescent strip light in the kitchen in a poor state of repair. Most of the fittings in the main building have compact fluorescent bulbs. Lighting used in this example can be found at: https://www.tlc-direct.co.uk.

LED lights are more energy efficient and exist for nearly every fitting. They can reduce electricity use by up to 90% compared to other lighting. Additionally LEDs last up to 35,000 hours before they need to be replaced resulting in reduced maintenance costs.

Actions

Guest House - Carry out an inventory of current lighting to confirm the number of light fittings in the guest house noting number and type of each light (see estmates in table below).

Main House - Once current lighting stocks are used, ensure LED lights are always used to replace any future failed bulbs or tubes.

Location	Current light	Replacement LED	Cost	Savings per year
Guest house bedrooms 	25 x 60W bulbs = 1.5kW	25 x 9W LED bulbs (warm white) = 0.22 kW	25 x £1.50 = £37.50	£147 (3 months payback)
	11 x 60W R50 bulbs = 0.66kW	11 x 8W LED R50 bulbs (warm white) = 0.088 kW	11 x £4.50 = £50.50	£66 (9 months payback)
Kitchen	1x 5ft fluorescent tube = 0.058kW	1x 5ft LED tube (cool white) in new fitting = 0.026kW	1 x £27	£4 (6.7 yr payback) - includes modern light fitting

Savings based on lights on 1000 hours/year (20 hours x 50 weeks)@11.5p/kWh. Payback does not include the cost of installation which may be carried out by in-house volunteers.

When selecting replacement lights there is also an opportunity to provide better lighting rather than using equivalent lights. Consider both the light quality preferred (known as colour temperature) that ranges from warm white, cool white or daylight and the level of brightness needed (measured in lumens).

Ensure that, whichever supplier you use, they offer a minimum 5 year failure replacement guarantee and are prepared to let you test a number of LEDs to ensure the light quality is correct before making a final purchase.

Savings calculations

See table above.

Alternative suppliers: http://www.lightingsupermarket.com and www.ledhut.co.uk.

Add lining to curtains		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
743	**68**	**300**

The window curtains in the guest house are not lined.
Adding insulated lining to your curtains is an excellent way of keeping the heat inside the room on cold nights and can also improve the acoustic properties of the room.

Actions

Curtain lining can be ordered to measure and installed by staff. Alternatively you may be able to get a volunteer to line the curtain for the cost of the material.

Encourage building users to close curtains in the evening even if they are not in the room to keep the heat in. This could be promoted with signage or verbal reminders.

Savings calculations

Cost:

The cost for curtain lining material would start at about £20 per window per window for 15 windows.

Saving:

Savings estimate assumes a 5% reduction in heating in guest house
Guest House annual electricity use £2704/ 29708 kWh. Savings assume 50% of this figure is on heating.

Install electric wall-mounted heaters

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
5492	**276**	**2500**

The guest house is currently heated with night storage heaters than heat up the building during the day when it is barely used and have cooled down by the evening when the building is most used. A more modern heating system is being considered to replace the current system, which is deemed inadequate. Replacing the current heating system with an electric heating system of individual radiators would allow localised control and warmth when it is needed in the evening.

Electric wall mounted heaters are installed without plumbing. They are thermostatically controlled and can be purchased with a central programmer that will operate all radiators in the building allowing you to warm the building in advance of guests arriving however you may prefer individual bedroom control with regular checks and control by guest house cleaning staff. Electric heating systems can be powered using solar PVs, even in winter.

Actions

Obtain quotes for wall-mounted electric heaters from local, qualified electricians. We recommend obtaining at least 3 quotes.

Your electrician will be able to adapt the storage heating wiring for these radiators and add the pilot wiring system for the central programmer if appropriate.

This type of radiator is most effective in buildings with good insulation as without this the room cools down quickly once heaters are turned off. Ensure that ceiling insulation improvement is carried out before installation.

Ensure that the heater is fully guaranteed with a service agreement in place (preferably built into the cost) for a number of years.

Ensure that the heaters you select have an in-built thermostat to avoid over heating the rooms.

Simple operating instructions are provided by the installer and should be attached to the heating controls to guide users. Additionally, Abbey staff that service the rooms should be trained to turn individual radiators down low if no guests are using the rooms for a few days.

For examples see:
http://www.dimplex.co.uk/products/domestic_heating/installed_heating/panel_heaters/exp_range/index.htm
and http://www.heatersuk.com/sunhouse-sphn200-2000-watt-electric-panel-heater-with-manual-control-in-willow-white.html.
Dimplex have a useful heating calculator to estimate the size of heaters you will need for the guest house https://www.dimplex.co.uk/room-heating-calculator.

Savings calculations

Cost:

2kW electric heaters @ £100 each, not including installation.

Approximate cost for guest house 15 heaters plus full installation = £2500

Savings:

Using these heaters will result in less night-rate electricity use and more day-rate electricity use in order to provide a more comfortable environment for the guests. Close control of these heaters is estimates to reduce electricity use for heating by 20%.

Current: Guest House annual electricity use £2704/ 29708 kWh. Savings assume 50% of this figure is on heating = £1352 and 14852kWh.

Proposed: 15 x 2kW heaters on 15 hours a day at full power at 80% occupancy for 26 weeks of the year = 9360kW x 11.5p = £1076

Add internal wall insulation		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
522	**60**	**201**

The north facing wall of the guest house has an area of solid wall that was not upgraded in the 1980s. Heat is lost through this solid wall making this a cold bedroom.
Increasing insulation will minimize heat losses in winter, Improve comfort levels for users and reduce annual energy bills by reducing heating requirements.
Internal wall insulation is suitable when rooms are spacious enough to afford some loss of area, or when owners do not wish to alter the outside of the building It is done by fitting rigid insulation boards to the wall, or by building a stud wall filled in with insulation material such as mineral wool fibre. Depending on the type of insulation used, stud walls are usually of a greater depth and are therefore strong enough to support fittings such as radiators.

Actions

Discuss the application of rigid insulation boards to this wall with volunteers. Using 72mm thick Celotex thermal insulation with laminate (see link below) is not the least expensive option however, as it is already finished on one side ready for plastering, it would be the most practical for a volunteer to install. This can be fixed to the wall using wooden batons or dry wall adhesive. As there have been issues of damp on this wall in the past, ensure that this is cleared up first. The wooden baton method may be preferable as it allows you to more easily remove the insulation to investigate further damp problems.
In traditionally built properties with solid walls, some manufacturers recommend using breathable (also known as vapour permeable) solid wall insulation materials as these allow continuous movement of air (vapour) and this helps reduce the possibility of moisture build up. If you have concerns about the need for this wall to 'breathe' you may want to consider vapour permeable insulation which will be more expensive.
If volunteers are carrying out this work it may be useful to read the following guidance
https://www.ovoenergy.com/guides/energy-guides/the-ultimate-guide-to-solid-wall-insulation.html

Savings calculations

Cost:

Insulated foam plasterboard for the wall. Wall size 4.32 x 2.06 = 8.9m2
3 sheets of 72mm thick Celotex thermal insulation with laminate @ £42/sheet = £126 plus VAT fitting and painting (£50 estimate) = £201
http://www.insulationgiant.co.uk/Celotex-Insulation-PL4060-Thermal-Laminate-60mm-Plus-12-5mm-2400mm-x-1200mm-/p/629245

Saving

Insulation savings for internal wall insulation based on Energy Saving Trust estimates adjusted for electric heating. Financial savings are minimal however this action will improve the comfort of the room for guests.

ENERGY SAVINGS OPPORTUNITIES

Repair/replace double glazing		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
-	-	-

The double glazed windows in the guest house are showing signs of wear and tear with evidence of condensation appearing between the panes of glass. This will reduce the insulation properties of the windows.

Repairing the double glazed windows may be possible by repairing the seals and re-filling them with argon gas. This is a specialist job. Alternatively the glass may need to be replaced without replacing the frames where they are still in good condition.

As a final resort some of the windows may need to be replaced.

Actions

Obtain 3 quotes from local specialist double glazing repair companies to repair the current windows as described above.

Two local glaziers who may carry out this work are:

Corin Mills of Witney (01993 704 476)

BS Glass based in Headington. See http://bs-glassoxford.co.uk/glazing-and-window-repairs-oxford.

Saving calculations

The cost of repair will vary depending on the current condition of the windows.

ENERGY SAVINGS OPPORTUNITIES

Replace gas boiler

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
10162	**220**	**1500**

An inefficient boiler will waste energy by using more gas than a new, efficient boiler to heat the same area of building.

Your Potterton and Worcester boilers in the main building are both fairly new and efficient. The third boiler is a Valiant Thermo Compact 242 EH 29.6kW non-condensing conventional boiler. This type of boiler was no longer manufactured after 1996 therefore it is at least 21 years old and is only 72% efficient.
A new condensing boiler to replace this boiler could be up to 91% efficient.
http://www.homeheatingguide.co.uk/efficiency-tables.php?model=000779.

Actions

Obtain quotes from at least three qualified heating contractors for replacement of the Valiant boiler with a modern condensing boiler that is A rated and over 90% efficient.
If it is not known, establish which areas of the house are served by this boiler.
Ensure the new boiler is correctly specified (boiler type, output, etc.).
Many contractors will over-specify a boiler. Ensure the output capacity matches the current and planned needs of the building.
As this boiler also provides hot water for the kitchen and some of the bedrooms, ensure that the replacement boiler is separately programmable for heating and hot water.
Ensure that full training on programming the boiler is provided and instructions are left for users.
Programme the heating and hot water to match user requirements.

Savings calculations

Costs:

A replacement A- rated boiler of the same size costs in the region of £1000 plus programmer, thermostat and installation = £1500. A typical boiler installation using existing pipework would take about one day.

Savings:

Savings for boiler replacement are based on Energy Saving Trust estimates which include an A-rated boiler and adding a new programmer and room thermostat. Estimated saving = £220
A useful guide to boiler efficiency ratings and replacement options can be found here:
http://www.homeheatingguide.co.uk/efficiency-tables.html.

ENERGY SAVINGS OPPORTUNITIES

Consider adding solar PV panels

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
5838	**748**	**12600**

Both your south and west facing roofs on the Guest House could potentially be used to site solar PV panels to provide electricity for your business. By using the sun's energy to provide electricity you will reduce the amount of power you draw from the grid and therefore save money on your energy bills. Additionally, although at lower levels than in previous years, there is still a Government subsidy for solar PV that pays both for every kW of power generated and for the electricity exported back to the grid when it cannot be used on site.

Actions

Solar panels will need to be installed by a specialist company who will both price up a system and assess the practicality of PV panels on your roof, e.g. will your roof would bear the weight? Will summer tree cover block out the sun on the panels?

Contact three solar panel contractors to obtain quotes – see links below

There may be an opportunity for the Low Carbon Hub to install solar panels on your roof at no charge. In this case part of the savings in electricity, along with the Government subsidy, is used to re-pay investors and invest in the local community.

See these useful links for more information:

http://lowcarbonhub.org/ - Low Carbon Hub.

http://www.r-eco.coop/ - Oxfordshire solar installer and worker cooperative.

http://www.solartech.org.uk/ - Oxfordshire based.

http://www.solarcentury.com – Large London based well-known installer.

Savings calculations

Costs:

Roof areas estimated at 4m x 3m south facing and 3m x 16m west facing - panel calculations from http://www.solarguide.co.uk/solar-pv-calculator= £12599

Savings:

The calculations use the current subsidies for this size of solar array. Accurate costing will be provided by the contracting companies. Savings using solar calculator = £748/year 5838kW /year for a 8kW array

ENERGY SAVINGS OPPORTUNITIES

Consider adding solar thermal panels

Energy saving (kWh)	Cost saving (£)	Cost of action (£)
4826	**550**	**5000**

A solar thermal system (also known as a solar water heating system) uses the sun to heat hot water free. Solar thermal panels qualify for the Government's Renewable Heat Incentive (RHI) that pays for every kW of heat generated. Eligible installations receive quarterly payments over 20 years based on the amount of heat generated. Once fitted, solar panels emit no pollution.

The guest house uses hot water for showers, washbasins and the kitchenette. Both your south and west facing roofs on the guest house could potentially be used to site solar thermal panels to provide some of this hot water. The ideal location is on an un-shaded roof at an angle of 30° against the horizontal plane.

Actions

A solar thermal system will need to be installed by a specialist company who will both price up a system and assess the practicality of PV panels on your roof e.g. will your roof would bear the weight? What are the costs of a replacement hot water tank to suit your requirements?

Contact three solar thermal contractors to obtain quotes. The following companies are Oxfordshire based:

http://www.solartech.org.uk/ - Oxfordshire based

http://www.simssolar.co.uk/ - Oxfordshire based

http://www.soloheatinginstallations.co.uk/ - National

Savings calculations

The calculations use the current subsidies for this size of solar array. Accurate costing will be provided by the contracting companies

Indicative Costs:

According to The Eco Experts http://www.theecoexperts.co.uk/solar-thermal-panels a 6m² solar thermal system would cost approximately £5000 fully installed.

Savings:

You could save 50-70% of the energy required to heat your hot water. For the above system savings are estimated at £550/year.

Further info:

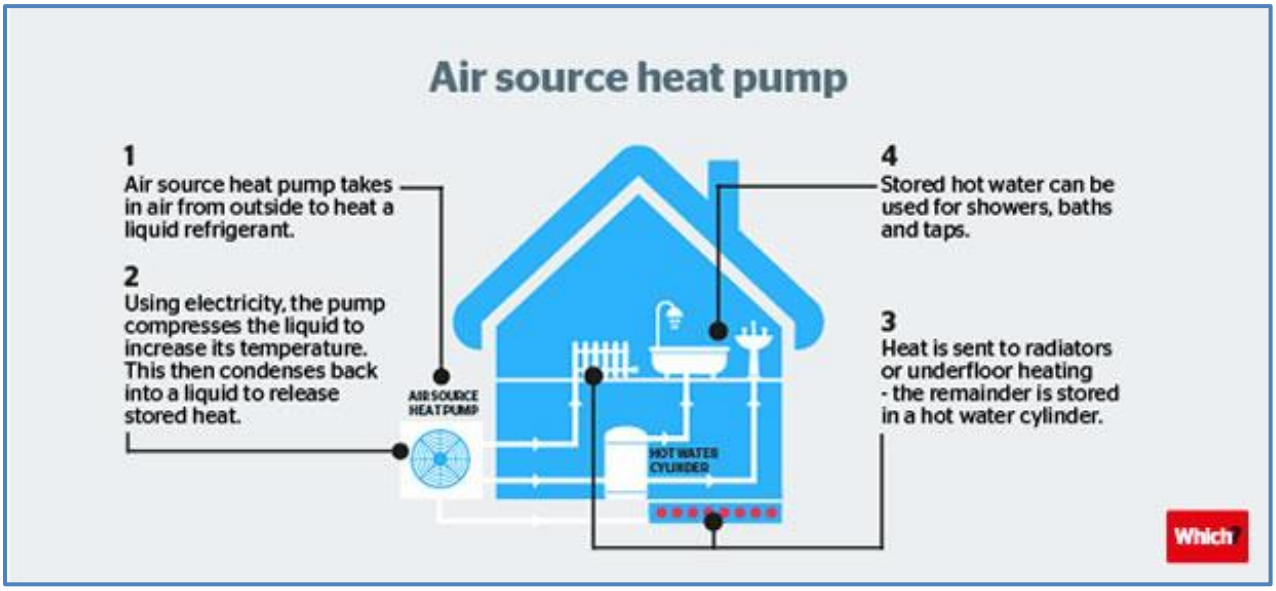
For helpful general information on solar thermal technology read the Carbon Trust report here: http://www.solarthermalworld.org/sites/gstec/files/Carbon%20Trust.pdf

Or the Which? Guide to Solar Water Heating here: http://www.which.co.uk/reviews/solar-panels/article/how-to-buy-solar-panels/how-does-solar-water-heating-work

For an easy Guide to the non-domestic Renewable Heat Incentive go to: https://www.ofgem.gov.uk/system/files/docs/2016/07/es957_easyguide_to_ndrhi_2016.pdf

Consider air-source heating		
Energy saving (kWh)	**Cost saving (£)**	**Cost of action (£)**
4100	**922**	**9000**

The current heating system was installed in the 1980s and needs replacing.
The premises are not connected to the gas network.



An air-source heating system provides the opportunity to heat using a renewable resource of energy whilst reducing your energy bills. An air source heat pump (ASHP), usually placed outside at the side or back of a property, uses a heat pump to boost heat from the air and transfer this to a heating system, reducing overall energy used. ASHPs are compatible with radiators, under floor heating systems or even warm air convectors and hot water.
Air Source Heat Pumps qualify for the Governments Renewable Heat Incentive Scheme https://www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi. Income from the Renewable Heat Incentive will help reduce the payback period of investment. The non-domestic RHI is currently paying 2.61p for every kW of power generated by air source heat pumps with payments lasting 20 years.

As the heat produced by an ASHP is cooler than that from a conventional boiler, a supplementary heating system such as under-floor heating or larger radiators would need to be installed. ASHPs can produce heat for both heating and hot water.
ASHPs are powered by electricity, pumping fluid in the outside loop, so there will still be running costs. Every unit of electricity used by the pump produces 2 to 2.5 units of heat making this an efficient way to heat a building.
If coupled with solar technology producing electricity to power the pumps, this technology could provide background heating at very low running costs.
Because the heat produced is at a lower temperature it is very important that the building is well insulated prior to a heat pump installation.

For further explanation of ASHP see:
http://www.which.co.uk/energy/creating-an-energy-saving-home/guides/air-source-heat-pumps-explained

Actions
ASHPs operate differently from conventional heating systems. Review the links (ABOVE) to find out more

information about options for air source heat pumps.
Use the Carbon Trust's Green Business directory as a source of suppliers in the region who have been accredited by the Carbon Trust. https://www.carbontrust.com/resources/green-business-directory

Request a visit from 3 competent and qualified suppliers to draw up an ASHP specification for your building.

Savings calculations
Costs:
Accurate costing will be provided by the contracting companies. Costs for 2x 8.5kW Ecodan installed are in the region of £8000 - £10000 including new radiators and pipework **http://tinyurl.com/yczb3pvb**
Ecodan running cost £880/year compared to current £1352/year saving £472/year
RHI payment in the region of £400-500 per year.
Savings aided by this link: https://ecodanselectiontool.mitsubishielectric.co.uk/#

FURTHER RESOURCES

Rain Water Harvesting

Linda expressed interest in further information on rainwater harvesting schemes.
We recommend that you look at the following company websites where you will find helpful information on rainwater harvesting. Contact them for further information on prices and a site visit for quotes:
https://www.stormsaver.com/ - Tel: 0844 884 0015 E-mail: enquiries@stormsaver.com –below-ground systems.
https://www.rainwaterharvesting.co.uk/rainwater-systems-35 - Tel: 01733 405 104 E-mail: sales@rainwaterharvesting.co.uk – both above and below ground systems

Funding

Possible sources of funding for the recommendation in this report:

OxFutures – 25% funding towards the cost of energy reduction and generation measures. Contact Barbara Hammond E-mail: barbara.hammond@lowcarbonhub.org

LEADER- http://www.oxfordshireleader.org.uk/

TOE2 – contact Fiona Danks on 01865 407003 admin@trustforoxfordshire.org.uk (conditions apply but funding may be available for recommendations for the main house)

Historic England - https://www.historicengland.org.uk/services-skills/grants/our-grant-schemes/repair-grants

Carbon Trust Green Business Fund - https://www.carbontrust.com/client-services/programmes/green-business-fund/