Energy Solutions Oxfordshire

Feasibility Report

Burwell Hall

ENERGY SOLUTIONS OXFORDSHIRE®

Introducing this Feasibility Report

This Feasibility Report has been produced using the information gathered during our virtual visit to your premises. It contains our findings on your existing energy usage, as well as our expert recommendations to improve the energy efficiency of your premises based on the preferences you have expressed to us – reducing the cost of your energy bills, and the carbon emissions your organisation is responsible for.

Company name:	Burwell Hall
Contact name:	Nicky Coyley
Postcode:	OX28 5NP
Total site area:	354m²
Energy use source:	Electricity & gas
Main heat source:	Yes

Next steps

1. Read and review the suggested improvements in this report.
2. We will call you within the next week to make sure you understand the information in this report, answer any questions you have, and discuss moving forward to the implementation phase.

Our energy recommendations – at a glimpse

The energy reduction recommendations that we have for your organisation are outlined in a snapshot in the table below, and in more detail on the pages to follow.

Type	Recommendation	Annual savings	Cost range
Heating Option A	1. Ground source heat pump	£1,683	£20,000 to £35,000
Heating Option B	2. Air source heat pump (air to water)	£1,170	£15,000 to £20,000
Hot water	3. Timers for hot water heaters	£99	£500 to £700
Heating	4. Zone heating in changing rooms	£548	£600 to £800
Lighting	5. Replace lights with LEDs	£67	£400 to £500
Renewables	6. Solar PV panels	£631	£10,000 to £12,000
Insulation	7. Ceiling insulation	£242	£10,000 to £15,000
Management	8. Additional low & no-cost measures	£322	£0

Please note that the cost ranges and savings are estimated figures. These can be refined based on actual quotations from contractors if you choose to go ahead and continue working with us. Savings also depend on what heating option is chosen and timing of other measures.

ESOx can offer further services. Our fees for each will depend on the measures to be progressed and other details, and can be provided on request.

Bid writing support for funding

There are several funds that Witney Town Council can potentially apply for to progress measures in Burwell Hall. We offer support writing applications and completing technical details.

Implementation support

When funding for measures is secured, ESOx would draft specification letters and invite multiple contractors in our network to provide competitive quotes measures at Burwell hall you would like to progress. We would arrange and conduct contractor site visits for each measure, scheduling and liaising with you. We would collect, validate, and analyse quotes, advising on the benefits and concerns of each.

Installation support

Once contractors are chosen, we can manage the installation of measures, being the main point of contact, scheduling contractors, collecting key documents, and advising you on issues arising. This service also includes verifying completion and performance of measures installed and validating savings over a 12 month period.

Potential savings from the recommendations

Based on the findings from our visit to your premises and information subsequently provided, we are recommending energy efficiency measures which would reduce your kWh usage by:

95%

reduction in energy usage

This would represent the following cost savings for your organisation:

£33,729

total avoided energy costs over 10 years

This is an estimate based on installing a ground source heat pump and other recommendations, which will be further refined based on actual quotes from contractors if you choose to go ahead to the next stage of implementation.

£9,175 *- No action*
Your annual energy cost in 10 years' time with no action

£4,834 *- Implementing all recommendations*
Your annual energy cost in 10 years' time if you make improvements

47%

Your current energy profile

Based on information provided, your existing energy consumption is as follows - including annual kWh consumption, annual costs, and energy tariffs.

4.13p	15.19p
(gas)	(electricity)

	Gas	Electricity	Totals
Annual energy expenditure (excluding VAT)	£3,423	£1,737	**£5,160**
Annual kilowatt hours of energy consumption	77,906 kWh	10,130 kWh	**88,036 kWh**
Annual tonnes of carbon equivalent	14.27 t CO_2e	2.15 t CO_2e	**16.42 t CO_2e**

How your annual energy is used

Units of floor area			
354 total m²	£14.58 per m²	248.69 kWh per m²	46.38 kg CO_2e per m²

Measure 1: Heating Option A - Ground source heat pump

Installing a ground source heat pump (GSHP) system would result in the following savings from

avoided energy:

£1,683
per year on energy bills, based on your current energy tariff

67,778 kWh
per year of energy

12.12 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£20,000 and £35,000** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

The hall is currently heated by a gas fired boiler. A ground source heat pump system (GSHP) provides the opportunity to heat using a renewable resource of energy whilst reducing your carbon footprint.

How energy use will be avoided

GSHPs run on electricity but produce heat very efficiently, this means that if you put 1kW of electricity into the system you will get more than 1kW of heat energy out; this ratio is called Coefficient of Performance (CoP). Typically a ground source heat pump has a maximum CoP of 4, meaning for 1kW of electricity you will get 4 kW of heat. The actual ratio of 'electricity in' to 'heat out' will change over the course of the year.

Other considerations

Your current Potterton Kingfisher cf150 boiler was no longer manufactured after 1998 and therefore is at least 23 year old. It is a non-condensing boiler with an efficiency rating of 65% and is therefore an inefficient and carbon intensive method of heating the building. In comparison with a heat pump system, for every 1kW of gas into the current heating system you will only get 650W of heat out (at 65% efficiency). The most efficient gas boilers operate at an efficiency rating of around 92 to 94%.

In addition, this building is currently heated when not in use. Is is estimated that heating requirements could be reduced by 20% by programming the building to match occupancy. This reduction has been taken into account in savings calculations.

The replacement of the boiler with a GSHP will eliminate the need for gas in the building and make further savings through reduced boiler maintenance. However, the new GSHP will add approximately 10,000 kWh of electricity use or £1,519 per year. This can be reduced by investing in solar PV panels (see measure 6).

A GSHP system has both a heat pump and sub-surface pipework. GSHP pipework can be installed in 1.2 metre trenches about 1 metre down and can either be installed as straight pipes or coiled pipework, depending on a specialist survey. Pipework could be installed in the fields behind the hall and re-covered with grass. This work may also provide the opportunity to improve the drainage in the field.

Read more about GSHPs here:
https://www.thegreenage.co.uk/tech/ground-source-heat-pumps/

https://www.isoenergy.co.uk/ground-source-heat-pump

Measure 2: Heating Option B - Air source heat pump (air to water)

Installing an air source heat pump system would result in the following savings from avoided energy:

£1,170
per year on energy bills, based on your current energy tariff

64,402 kWh
per year of energy

11.40 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£15,000 and £20,000** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

The site is currently heated by a gas-fired boiler. An air source heat pump system (ASHP) provides the opportunity to heat using a renewable resource of energy whilst reducing your carbon footprint from the heating system.

How energy use will be avoided

ASHPs run on electricity but produce heat very efficiently, this means that if you put 1kW of electricity into the system you will get more than 1kW of heat energy out; this ratio is called Coefficient of Performance (CoP). Typically an air source heat pump has a maximum CoP of 3, meaning for 1kW of electricity you will get 3 kW of heat. The actual ratio of 'electricity in' to 'heat out' will change over the course of the year.

Other considerations

As detailed in measure 1 on page 6, your current boiler is at least 23 year old and only 65% efficiency. An ASHP would eliminate the need for gas in the building and make further savings through reduced boiler maintenance. However, the new ASHP will add approximately 13,500

kWh of electricity use or £2,050 per year. This can be reduced by investing in solar PV panels (see measure 6).

In addition, this building is currently heated when not in use. Is is estimated that heating requirements could be reduced by 20% by programming the building to match occupancy. This reduction has been taken into account in savings calculations.

An air source heat pump (ASHP), usually placed outside at the side or back of a property, 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. As the heat produced by an ASHP is less hot (50 to 60°C) than that from a conventional boiler (75 to 80°C) a specialist supplier will need to specify radiator sizes for your hall.

For further reading see:
https://www.greenmatch.co.uk/heat-pump/air-to-water-heat-pump

Measure 3: Timers for hot water heaters

Hot water tanks heating continuously

Changing the programme settings for your two 182 litre hot water tanks to coincide with Saturday football matches would result in the following savings from avoided energy use:

£99
per year on energy bills, based on your current energy tariff

3,379 kWh
per year of energy

0.61 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£500 and £600** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

The gas heated hot water tanks are programmed to be heating 364 litres of water continuously. This quantity of water is only required for showers after Saturday football matches in the football season. Programming the hot water to switch on only for these matches will reduce wasted energy. Programming them to turn on 2 to 3 hours prior to when hot water is needed should be sufficient to heat the water and also satisfy Legionella prevention measures for hot water.

How energy use will be avoided

Water tanks, while insulated, continually lose heat. Reducing the time that the tanks are standing hot will save energy.

Other considerations

By switching off the hot water tanks during the week you will no longer have hot water available in the kitchen or toilets. Hot water could be provided by installing a 15 litre under sink hot water heater in the kitchen and to serve the toilets. These can be fitted with timers to turn them off at night. Whilst these heaters use some electricity, as they are low energy, and rarely used, costs and energy use will be reduced.

If under-sink hot water tanks are installed a plumber will need to disconnect kitchen and toilet pipework to the current large hot water tanks to avoid two sources of hot water to these sinks.

Savings for this recommendation are based on your current heating system. The savings will change if a heat pump is installed, which could also provide hot water. We will be happy to recalculate savings based on heating your hot water with a heat pump if required.

Measure 4: Zone heating in changing rooms

Creating a separate heating zone for the changing rooms would result in the following savings from avoided energy use:

£548
per year on energy bills, based on your current energy tariff

13,244 kWh
per year of energy

2.43 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£600 and £800** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

The heating zone that includes the reception area, toilets, kitchen and meeting room also includes the radiators in the changing rooms and changing room toilets. The changing rooms are only used once a week on a Saturday, however the space is heated every day in line with the other radiators. Zoning the changing room radiators will allow them to be set to a different heating schedule to the remainder of the building.

How energy use will be avoided

Programming the changing room and changing room toilets to be at a frost setting for all but a few hours on a match Saturday will reduce wasted heat and therefore energy use.

Other considerations

An alternative to zoning is to instruct the caretaker to turn the thermostatic radiators valves on the radiators down to low and back up again before match days. However this is time consuming and may be forgotten.
Savings for this recommendation are based on your current heating system. The savings will change if a heat pump is installed, which uses less energy to heat your building.

Measure 5: Replace lights with LEDs

Replacing your existing light fixtures with energy efficient LED lighting panels and round LED fixtures would result in the following savings from avoided energy use:

£67
per year on energy bills, based on your current energy tariff

439 kWh
per year of energy

0.09 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£400 and £500** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

LED lights are more energy efficient using less energy than current fluorescent tubes and compact fluorescent lights (CFLs). Whilst most of your lighting has already been changed to LED, the changing room area is still lit by CFL lighting. Lighting can be upgraded to LEDs that use 50% to 80% less energy and last at least four times longer, reducing maintenance costs. The addition of lighting controls beyond on / off switches, such as absence detectors, will save more energy.

How energy use will be avoided

Lights use electricity over time. Each LED will require less energy than the non-LED light replaced; savings are based on the difference in energy between LEDs and the original lights. LEDs last longer reducing maintenance and replacement costs.

Lighting controls will reduce energy use further by turning the lights off when they are not required. This has been identified as a problem in the changing rooms where lights can be left on throughout the week if left on in error on a Saturday.

Other considerations

Contractors will review lights and consider other light characteristics such as angle and 'colour temperature', which alters the tone of the lighting, before providing a quote. Contractors may also recommend alternative lighting options following a site visit.

Measure 6: Solar PV panels

Installing solar PV panels on the rooftop of your premises would result in the following savings from avoided energy use through generating your own energy and income from the Smart Export Guarantee:

£631
per year on energy bills, based on your current energy tariff

3,900 kWh
per year of energy

0.71 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£10.000 and £12,000** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

There is sufficient space to install solar PV panels on east and west facing roof of your building to generate electricity from sunlight. In addition to installing an array of solar PV panels on the roof, an inverter is installed indoors to make the electricity compatible with your building's electricity demand. The system includes a meter to record how much electricity is generated and how much is exported to the national grid when not used immediately on site. The solar PV system operates so that generated electricity is used to meet on site demand; any surplus is exported.

How energy use will be avoided

Electricity generated by sunlight and used on site will replace electricity drawn from the National Grid. While the sun shines every day, the amount generated is affected by temperature and cloud cover; weather data is used to estimate performance.

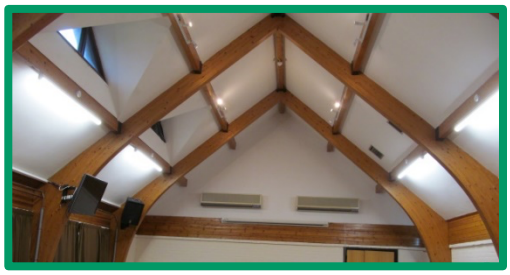
In order to maximise the financial benefit of solar panels most of the generated electricity needs to be used on site rather than exported. For ever kWh generated from solar panels that you use on site you will save 15.19p (the day time electricity rate from your supplier). For solar electricity exported back to the National Grid you will receive a maximum of approximately 3.5p per kWh from the Smart Export Guarantee, paid through your electricity supplier.

Other considerations

Based on a desk-top review of your roof and taking into account you concern over possible vandalism if solar was installed on the south facing roof facing the park, we estimate that you could install a 6.5kW solar array generating an estimated 5,200 kWh of electricity per year. We would anticipate 75% or 3,900 kWh of this generation will be used on site with the remainder exported when the hall is not in use.

If the town council's policy is to maximise carbon reduction, we recommend that you make full use of the roof space you have available to install the maximum number of panels the roof will allow, which may include some of the south facing roof also. Some of the electricity would be used on site and some exported, reducing the National Grid's dependence on fossil fuels.

Measure 7: Ceiling insulation



Installing insulation below the ceiling in your main hall would result in the following savings from avoided energy use through retaining heat in your building:

£242
per year on energy bills, based on your current energy tariff

5,843 kWh
per year of energy

1.07 tonnes
per year of carbon dioxide equivalent

We estimate a budget between **£10,000 and £15,000** for this measure with an additional service fee if you choose to progress this with support from Energy Solutions Oxfordshire.

Rationale and description

The ceiling in the main hall is only insulated to 1980s building standards when the building was built. Adding insulation below this ceiling will minimize heat losses in winter, reduce heat gains in summer, improve comfort levels for users and reduce annual energy bills by reducing heating requirements.

How energy use will be avoided

Up to 25% of heat loss from a building is through an uninsulated roof. Increasing roof insulation levels will reduce the cost of heating by retaining the heat in the building for longer.

Other considerations

Internal ceiling insulation is normally installed using insulation board that is cut to fit between the rafters and plastered and painted over.

This measure will require scaffolding and therefore should be scheduled for a period when the hall is closed or less busy.

Savings for this recommendation are based on your current heating system. The savings will change if a heat pump is installed, which uses less energy to heat your building. We will be happy to recalculate savings on this basis if required.

Measure 8: Additional low & no-cost measures

Taking action on low or no-cost actions identified below would result in the following savings from avoided energy use:

£322
per year on energy bills, based on your current energy tariff

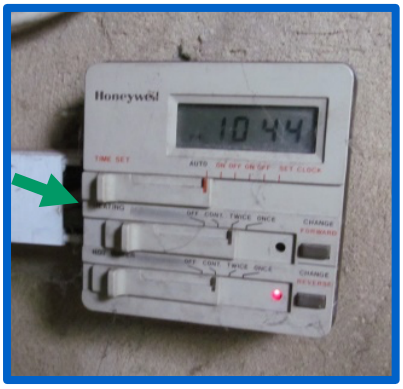
7,791 kWh
per year of energy

1.43 tonnes
per year of carbon dioxide equivalent

There is no cost to these measures apart from staff time.

Rationale and description

Ensuring that the building in run as efficiently as possible with energy reduction in mind can reduce carbon and costs whilst retaining a comfortable environment for users. Consider the following actions:



1) Repair the thermostat / check the programmer – During the site visit the thermostat that controls the heating for all areas apart from the main hall was set to 10˚C however the temperature in the building was considerably hotter than that - all the radiators were still on. This suggests that the thermostat is not controlling the temperature and the boiler is providing heat to the radiators only based on the scheduled heating times that are set to twice a day. Additionally, the controller (see image) was showing that the heating was not on (absence of red light) however the radiators were still very hot. This may be because the timer had just switched them off. We recommend that a heating engineer reviews these controls, carries out repairs if required and provides clear instructions.

2) Set heating time to match usage – There were no bookings in the building for the morning of the assessment visit however the heating was on, presumably on the 'twice a day' setting. Matching heating times to building usage, reducing the heating to a low setting such as 10 to 12˚C between bookings, will reduce energy use.

3) Make use of the ventilation system in the main hall - The ventilation system was not in use and little is known about what this can provide, however using it may be a lower carbon / cost solution than using the air-conditioning in the hall in summer. Review the ventilation system with an HVAC contractor to identify how the use of this system can reduce energy use.

4) Turn off the kitchen hot water boiler when not in use - The hot water boiler is switched on at all times for very little use. Either turn the hot water boiler on in advance of requirement or instruct users to turn it on as required.

5) Take and report gas meter readings – Gas meter readings used by your gas supplier to calculate your bills in 2019 (the data supplied) are based on estimated readings. Reading the meter monthly and reporting the reading to the gas supplier will allow accurate billing and improve understanding of how gas is used throughout the year.

How energy use will be avoided

Energy use will be avoided through stricter control of heating and cooling systems and improved understanding of how energy is used in the building.

Other considerations

Compiling a file of how the heating and cooling systems work in the building and retaining this information for handover to future building managers will ensure that the building continues to operate efficiently through staff changes.

Next steps

The next steps for your energy improvement project are as follows:

- You read and review the information and recommendations in this Feasibility Report.
- Our Business Development Manager, Richard Dorey, will call you within the next week to discuss the report – ensuring you understand the information given, answer any questions you may have, and discuss which recommendations you'd like to proceed with.
- You decide which recommendations you'd like to move forward with. You may be ready to do this during the call with Richard, or you may need to discuss this with other members of your team – in this case Richard will follow up with you afterwards.

An overview of the full Energy Solutions Oxfordshire process is below. You are currently part-way through the second phase – Feasibility.

An overview of the ESOx process