OxFutures

**Energy Saving Recommendations Report**

**for**

**Duns Tew Village Hall**

**January 2022**

**Survey of Duns Tew Village Hall**

European Union

European Regional Development Fund

OXFORD BROOKES UNIVERSITY

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# ORGANISATION OVERVIEW

| Report overview |
|---|
| EiE carried out a site visit and met with Alison McKay and Sarah Taylor. All recommendations in this report are based on information and observations obtained prior to and during the site visit, and information subsequently provided. The report is set out in order of recommended priority based on ease of implementation, carbon impact, cost and factors discussed on site. |

| Client details | | |
|---|---|---|
| **Organisation name** | Duns Tew Village Hall | Middle Barton Road,<br>Duns Tew OX25 6JN |
| **Contact name** | Alison McKay | ali.mckay@tiscali.co.uk<br>01869 340096 |
| **Date of site visit** | 19/01/2022 | 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.

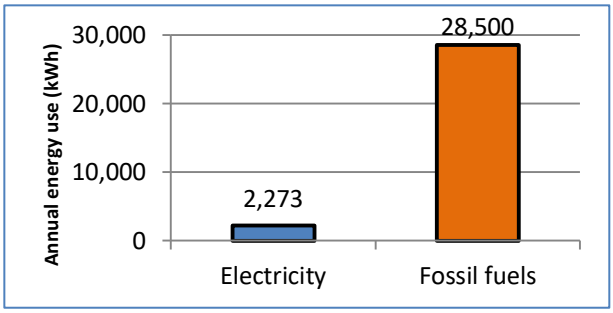
| Opportunity | Savings (kWh / yr) | Savings (£ / yr) | Cost (£) | Initial Payback (yrs) | Carbon Impact ($tCO_2e$ / yr ) |
|---|---|---|---|---|---|
| Take and submit meter readings | 0 | 0 | 67 | n/a | 0 |
| Add draught proofing to storeroom doors | 1,425 | 50 | 100 | 2.00 | 0.38 |
| Upgrade lighting to LEDs | 1,387 | 181 | 1,973 | 10.88 | 0.29 |
| Install secondary glazing | 285 | 10 | 180 | 14.99 | 0.08 |
| Consider a heat pump system | 20,425 to 22,444 | -56 to 208 | 14,000 to 20,000 | n/a | 5.93 to 6.36 |
| **TOTAL** | **23,322 - 25,341 kWh/yr** | **£185 - £449/yr** | **£16,320 - £22,320** | | **6.68 – 7.11 $tCO_2e$ / yr** |

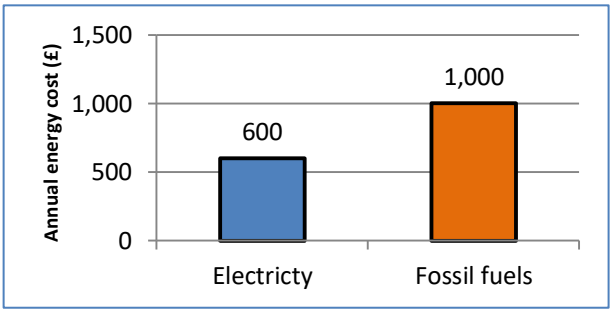
| Site details |
|---|
| This building was originally constructed as a school house in 1870 and subsequently repurposed as the village hall. Entrance hall and toilet extensions were added in 1992 and 2004, with the roof replaced in 2009. The building is stone built and consists of a main hall with stage, storeroom, entrance hall, kitchen and toilets. It is heated with an oil boiler with fan convector heaters and radiators. The space is in use for an average of 15 hours per week for a variety of activities including yoga, band practice, boot camp and dance. Bookings are occasional, weekly and regular monthly social events at weekends. The pantomime group use the hall for rehearsals and production from September to December. |

# ENERGY PROFILE

| Energy consumption annual profile | | | | |
|---|---|---|---|---|
| **Fuel type** | **Annual Energy use (kWh)** | **Cost per kWh (p)** | **Standing charge (p/day)** | **Approx. annual cost (£)** |
| Electricity | 2,273 | 13.077 | 30.41 | 600 |
| Fuel Oil | 28,500 | 3.51 | 0 | 1,000 |

**Energy profile breakdown for Duns Tew Village Hall consumption (left) and costs (right)**
**8.12 tonnes of $CO_2e$ from annual energy consumption**




Consumption is based on figures provided.

## Carbon Impact

6.68 tonnes of $CO_2e$ avoided per year from implementing recommendations (ASHP solution) in this report – an 82% reduction in carbon emissions.

# ENERGY SAVINGS RECOMMENDATIONS

| Take and submit meter readings | | |
|---|---|---|
| **Energy saving (kWh)** | **Cost saving (£)** | **Cost of action (£)** |
| 0 | 0 | 67 |

Electricity

Most of your electricity bills are based on estimated readings. By recording and submitting actual electricity meter readings to your suppliers, SSE, regularly and accurately, energy bills will be correct. Readings help build an energy profile that will help identify unexpected changes in energy use. This will be particularly useful to monitor the success of energy improvements you make. We recommend appointing someone to take monthly meter readings and submit them to energy suppliers.

Oil

Your oil use is based on oil deliveries rather than monthly use. Oil use is difficult to gauge, however there are a number of devices on the market that will allow you to estimate how much oil you have used. The purchase price of gauges is generally indicates accuracy (more costly often means greater accuracy), however a gauge similar to the one at the link below is £67 including VAT. It would allow you to estimate oil use fairly accurately on a monthly basis. See:
https://www.fueltankshop.co.uk/adjustable-clock-gauge/p4916

Note that before making this purchase, there may be a householder in the village that has an oil gauge that they no longer use that could gift it to the village hall.

**Actions**

- Arrange to record actual electricity meter readings on the same day once per month.
- Submit meter readings to your energy suppliers prior to billing (the timing of this will depend on your supplier). Depending on your supplier, readings can be submitted via website, email, or by telephone.
- Consider purchasing an oil gauge and recording usage on the same day each month.
- Use monthly energy consumption data of electricity and oil to form a baseline of use so that you can easily detect and act upon unexpected rises in use, as well as savings from implementing saving measures. Review of data will need to be compared to hours of building use.

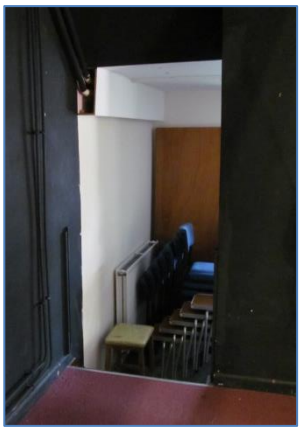
**Costs and savings**

Costs are based on £67 for an oil gauge. There are no savings specifically linked with this recommendation however a greater understanding of how energy is used in your building will inform further actions.

| Add draught proofing to storeroom doors | | |
|---|---|---|
| **Energy saving (kWh)** | **Cost saving (£)** | **Cost of action (£)** |
| 1,425 | 50 | 100 |

External Door

There is a draught from a gap around your exterior door from the storeroom where there was a noticeable draught. There is an opportunity to improve this. Any gaps around the doors will let in cold air and draughts; blocking gaps with draught proofing will greatly reduce this. We recommend adding draught proofing or replacing rotten wood to reduce draughts and discomfort during colder months. Examples of draught stripping can be found at the link below. Alternatively, you may be able to replace the worn wood to create a tight fit on this door. See:
https://www.screwfix.com/c/security-ironmongery/weatherstrips/cat840964?cm_sp=managedredirect-_-ironmongery-_-weatherstrip



Doorways from storeroom to stage

The storeroom is heated to a lower temperature than the main hall (it is only heated to control damp) and has an uninsulated flat roof, resulting in the storeroom being colder that the main hall. Heat from the main hall will be lost to the storeroom. This heat loss can be reduced by adding doors or heavy curtains on the two doorways between the stage and the storeroom. Curtains may be a more practical solution as they can be pulled to one side during productions when the storeroom is in constant use as 'off-stage'.

A volunteer from the village may be able to make these curtains if the material is provided.

**Actions**

- Add draught proofing to the door or door frame of the external door from the storeroom.
- Engage a volunteer to sew heavy curtains for the doorways between the stage and storeroom or install doors.

**Costs and savings**

Costs are based on £10 for draught-stripping and a further £90 for curtain material. Savings are based on reducing heating costs by 5% as a result of this action.

## Upgrade lighting to LEDs

| Energy saving (kWh) | Cost saving (£) | Cost of action (£) |
|---|---|---|
| 1,387 | 181 | 1,973 |

Whilst some halogen bulbs have already been replaced with LED bulbs, there are many non-LED lights installed in the building that can be replaced with LEDs to reduce energy use and maintenance as well as providing improved lighting quality.

LED lights are more energy efficient and exist for nearly every lighting type. The following table details current lighting and replacements:

| | Current lighting | Wattage (W) | No. | Replacement lighting | Wattage (W) | No. | Annual savings (kW) | Annual savings (kWh) | Annual savings (£) | Total costs of replacements (£) |
|---|---|---|---|---|---|---|---|---|---|---|
| Entrance Hall | Spot lights | 50 | 9 | LED spot light | 4 | 9 | 0.414 | 323 | 42 | 27 |
| Entrance Hall | D lights | 28 | 4 | LED bulkhead | 14 | 4 | 0.056 | 44 | 6 | 80 |
| Toilets x 3 | 4ft T8 tube | 36 | 3 | LED tube | 14.5 | 3 | 0.0645 | 50 | 7 | 18 |
| Storeroom | D lights | 28 | 3 | LED bulkhead | 14 | 3 | 0.042 | 33 | 4 | 60 |
| Kitchen | Spot lights | 50 | 6 | LED spot light | 4 | 6 | 0.276 | 215 | 28 | 18 |
| Main Hall | Double T8 5ft tubes | 144 | 4 | LED lights | 40 | 4 | 0.416 | 324 | 42 | 240 |
| Main Hall | GLS bulbs | 100 | 6 | LED GLS | 15 | 6 | 0.51 | 398 | 52 | 30 |
| **SUB-TOTALS** | | | | | | | **1.7785** | **1,387** | **181** | **473** |
| | | | | | | | | | **Labour for 3 days** | **1,500** |
| **TOTALS** | | | | | | | **1.7785** | **1,387** | **181** | **1,973** |

The above figures are based on lighting being switched on for an average of 15 hours a week.

We recommend replacing lights with new LED light fixtures to reduce the cost of lighting. If the lighting design is changed then costs are likely to be higher.



When selecting replacement lights there is also an opportunity to provide better lighting rather than using equivalent lights. Several village halls, particularly those that are not used for sporting activities such as badminton, are moving away from fluorescent tube lights to pendant lights. Three examples of these are Freeland Village Hall, Finstock Village Hall and Goring Village Hall (see above images). Further photos of the lighting in these halls can be seen by going to the hall's website or an internet image search. When planning new lighting, 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 contractor you use, they offer a minimum 5-year failure replacement guarantee. They may also agree to let you test a number of LEDs to ensure the light quality is correct before making a final purchase.

Consider additional lighting controls, such as absence detectors, that will switch off lighting when no movement is detected for a period of time. This is particularly useful for toilets and corridors where users spend short periods of time.

**Actions**

- For all non-LED lights consult lighting contractors to discuss LED replacements.
- Discuss options for alternative lighting designs.
- Consider replacing all lights at once as lighting suppliers will offer a discount for buying LEDs in bulk.
- Discuss additional lighting controls, such as sensors, with contractors.
- We recommend contacting at least three lighting contractors for quotes.
- Choose a preferred contractor and arrange for the lighting and controls to be installed.

**Costs and savings**

Costs and savings are based on the lighting table above.

| Install secondary glazing | | |
|---|---|---|
| **Energy saving (kWh)** | **Cost saving (£)** | **Cost of action (£)** |
| 285 | 10 | 180 |

The majority of the windows in the building are single glazed, however they have recently been repaired and fit tightly into their frames, reducing draughts. The window in the storeroom, however, is also single glazed and has not been repaired, resulting in draughts and heat loss. Secondary glazing installed inside of single glazing will reduce heat loss and draughts to help keep the building comfortable in cold weather. We recommend installing secondary glazing to improve insulation and comfort.

There are numerous suppliers and installers of secondary glazing. Three local companies are here:
Bicester Glass: https://www.bicester-glass.co.uk/windows-and-doors
CN Glass: http://www.cnglass.co.uk/double-glazing/secondary-double-glazing/
A & C Glazing: https://www.aandcglazing.co.uk/windows/oxford-secondary-glazing/

However as this is a window in the storeroom, which is not opened, a low cost alternative is removable magnetic perspex glazing that can be self-installed. See:
https://www.magneglaze.co.uk/secondary-glazing/
https://www.secondarydiyglazing.com/secondary-glazing-systems/

**Actions**

- Engage a qualified contractor to discuss secondary glazing options.
- Alternatively, obtain a quote for a Magneglaze window or similar DIY secondary glazing solution.
- Choose a preferred supplier or self-install secondary glazing.

**Costs and savings**

Costs are based on a 1.5m² Magneglaze window at £100 per m² plus delivery, self-installed. Accurate measurements will be required. Savings are based on reducing annual heating expenditure by 1% as a result of this action.

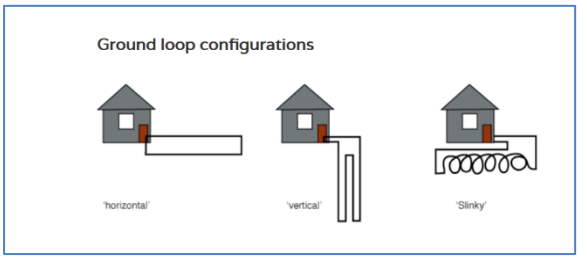
| Consider a ground or air source heat pump system | | |
|---|---|---|
| **Energy saving (kWh)** | **Cost saving (£)** | **Cost of action (£)** |
| 20,425 to 22,444 | -56 to 208 | 14,000 to 20,000 |

The current heating system is a Worcester Danesmoor 26/32 ROO non-condensing oil boiler that has a seasonal efficiency rating of 85%; modern boilers have a seasonal efficiency rating of 92-94%. See: https://www.homeheatingguide.co.uk/efficiency-tables?model=001778

There are two types of heat pump that you could consider to replace this boiler, which would reduce the carbon impact of the hall. Heat pumps run on electricity, however they use it much more efficiently than a traditional heating system therefore are a low carbon alternative to your current oil-based system. If you put 1kW of electricity into a heat pump you will get more than 1kW of heat energy out; this ratio is called Coefficient of Performance (CoP) and differs for ground and air source heat pumps. As the cost of your electricity is currently almost four times the cost of oil, the financial savings are negative or small (see cost savings), however as the price of energy increases over coming years the financial saving will increase.

Ground Source Heat Pump

You are planning to dig up part of the carpark to improve the soak-away and this may be the ideal time to install pipework for a ground source heat pump under your carpark.




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. A length of underground pipes is installed horizontally or vertically to circulate fluid that absorbs the relatively constant temperature below ground. The warmth in the fluid is increased via compression through the heat pump and transferred to a wet heating system. We estimate an 8 kW GSHP would be needed to heat the site.

Horizontal pipes are less expensive to excavate than a vertical bore hole and can be installed either as straight pipes or as coils. The choice of pipework collector is dependent on the sub-soil and is subject to specialist survey. There may not be sufficient space in your carpark for straight pipework to heat your building therefore a specialist contractor will need to advise on this. Read more about GSHPs here:
https://www.thegreenage.co.uk/tech/ground-source-heat-pumps/
https://www.isoenergy.co.uk/ground-source-heat-pump

Air Source Heat Pump (air-to-water)

An air source heat pump (ASHP) has a CoP of 3. Inertia in the air is increased via compression through the heat pump and transferred to a wet heating system and radiators. The AHSP unit is positioned outside the building and will heat hot water as well as heating radiators, which can be fan assisted (like your current radiators) or a traditional wet radiator system. We estimate 10 kW of ASHPs are needed to heat the site.

For further ASHP details see:
https://www.thegreenage.co.uk/tech/air-source-heat-pumps/
https://www.isoenergy.co.uk/air-source-heat-pump

General points about heat pumps:

- Heat pumps run at 40 to 60°C, which is cooler than traditional heating systems (70 to 80°C), so require longer heat up times.
- Heat pumps are best suited to well-insulated buildings, so ensure that insulation work between the storeroom and main hall is completed first. Your roof was insulated when it was replaced in 2009.
- Solar PV panels can supplement electricity costs for heat pumps for further savings (see further resources section).
- You may want to have some back-up heating available in case of extreme temperatures. The requirement for such a system will depend on what system is eventually selected.

**Actions**

- Discuss the potential for a GSHP or ASHP system at the site.
- Engage a qualified contractor to determine the feasibility of the project and develop specifications.
- Request quotes from three competent and qualified suppliers.

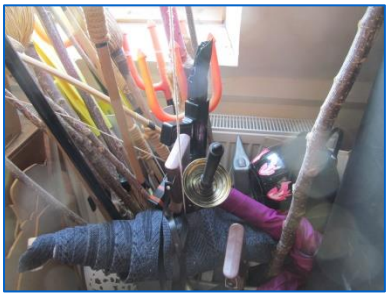
**Costs and savings**

Costs are based on £2,000 per kW for an 8kW GSHP system and £1,400 per kW for a 10kW ASHP system. Savings are based on a heating demand of 24,225 kWh (heat demand of current system, multiplied by 85% efficiency), divided by a CoP of 4, converted to electricity, for a GSHP system and a CoP of 3 for an ASHP system.

# FURTHER RESOURCES

## Additional actions

Turn down the radiator in the upstairs room



The radiator in the upstairs storage area was on at full heat. Whilst it may be important to keep heating on in that room to prevent damp, this room will already benefit from warm air rising from the rest of the building and the radiator could reasonable be turned down to 2 or 3 to provide background heating only. Additionally, if possible, avoid storing items in front of this radiator as this reduces its effectiveness.

Consider Solar PV

The pitch and angle of your roofs is not ideal for solar PV panels and, additionally, the majority of the use of the building is in the evening when PV panels will not be producing energy. PV panels would result in your solar energy largely being exported back to the grid, yielding a poor return on investment. Battery storage of solar generated electricity for use after dark would be an expensive option for the amount of electricity you use per year (approx. £600 at current prices). If, however, an electric heat pump system is installed we recommend that you reconsider some solar PV to reduce the carbon and cost of your heating system. Solar panels combined with a heat pump can produce background heating at a low cost.

Green Tariff

You may find the following article helpful in explaining the various levels of 'Green Tariff':
https://www.pawprint.eco/eco-blog/how-green-provider-green-energy-tariffs-explained

## Funding

Possible sources of funding for the recommendations in this report:
OxFutures – 25% funding towards the cost of energy reduction and generation measures. Contact Alison Grunewald. E-mail: alison.grunewald@lowcarbonhub.org.

## Your action progress update

Through the energy assessment process we will agree on what recommended actions your organisation would like to progress. After a number of months, we will ask for an update on your progress. Some actions will be completed, some in progress, and others not yet started. Below is an example of how you can indicate your progress (tick one box per row). There is no expected completion date for any action, however your information is extremely important for helping us track project improvements.

| Opportunity | Action completed | Partially completed | Not begun but intending to | Not begun, not intending to | Not applicable |
|---|---|---|---|---|---|
| Take and submit meter readings | ◯ | ◯ | ◯ | ◯ | ◯ |
| Add draught proofing to storeroom doors | ◯ | ◯ | ◯ | ◯ | ◯ |
| Upgrade lighting to LEDs | ◯ | ◯ | ◯ | ◯ | ◯ |
| Install secondary glazing | ◯ | ◯ | ◯ | ◯ | ◯ |
| Consider a heat pump system | ◯ | ◯ | ◯ | ◯ | ◯ |