Braunton Parish Council

Rural Community Energy Fund

Stage 1 assessment

Summary

The most cost effective savings can be achieved by changes to the lighting system. Replacing the current fluorescent tubes and CFL spot lights would achieve savings of 30-40%. The most sensible approach would be to replace fluorescent units as they fail, as the financial payback does not justify swapping out existing units. Swapping out the lighting in the meeting rooms and other spaces is still worthwhile, and should also be done as units fail. However cost savings will be lower due to lower usage.

Adding insulation to the roof, walls and floor would create an easier to heat building and a more pleasant environment. Costs for retro fitting insulation would be significant.

A roof mounted solar PV system would reduce daytime electrical demand, and would fit well with the buildings higher summertime electrical demand.

The most suitable renewable heating system would be a pellet boiler, or alternatively a log boiler using locally sourced timber. A log boiler would need to be combined with a community log supply arrangement of some sort to be cost effective.

Heat pump technology would not be suitable unless under floor heating was installed – there is insufficient wall space for low temperature radiator units.

The organisation is planning to refurbish and extend the front (east) of the building. This space may have significant portions of glazing and could be suitable for taking advantage of passive solar gain if constructed in the right way.

Figure 1 below gives an indication of likely savings from the suggested measures. Estimations are conservative.

Figure 1 Cost Saving Options

Option	Approx. Cost £	Cost Savings - £ p/a	CO2 savings – kg p/a	Simple payback - years
LED lighting retro fit – G13 tubes in main room	90	15	48	6
LED lighting retro fit – R63 spot lights (over standard bulbs)	80	7	26	11
Cavity wall insulation	1800	n/a	n/a	n/a
Roof insulation (panel – insulated)	5000	n/a	n/a	n/a
Pellet boiler (for surf museum and countryside centre) – excludes wet system	75000	RHI income of 6100	n/a	n/a
Log boiler system with plant room and log store	70000	6100 as above	n/a	n/a
Floor panel insulation	2800	n/a	n/a	n/a

A solar PV array on the roof will reduce daytime electrical demand. Details of costs and savings from a solar PV system are included in the financial appendix.

Building and Site

The building is currently open from Easter to October half term. One of the main reasons for the building only being open for part of the year is that it becomes very cold as there is no heating system.

Figure 2 Countryside centre satellite image

The building can be seen in the 'Bing Maps' satellite image above.

The building is located in the Caen Street Car Park in close proximity to the surf museum, to the south.

Figure 3 The front of the countryside centre (east side of the building)

The front of the building is where the proposed extension will be.

The south face roof space can be seen in this photo. It has two south facing pitches, both of which would support PV panels.

There may be some shading during the low winter sun from the surf museum building to the south and the trees to the west.

Figure 4 Area between centre and surf museum

The southern end of the countryside centre. The surf museum can be seen on the right. This parcel of land is leased by the surf museum.

The space shows the short run of heat main that would be required to link the two buildings, should a combined heating system be developed.

The building has no roof void. There is currently very little insulation in the building. The cavity walls are unfilled and the floor has no insulation. The building is comprised of a main space with display materials and a small office, a meeting room, toilet and storage room.

There is very little natural daylight at present. The day of the site visit was bright and sunny, yet all of the buildings lights were still in use.

Figure 5 high ceiling of the main room

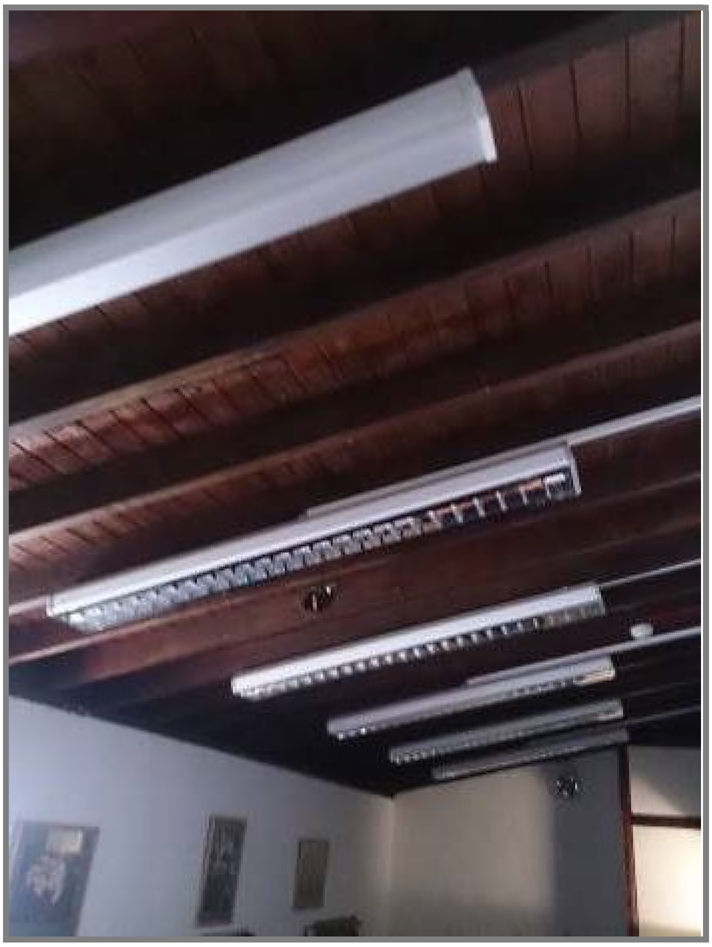
The can be seen in the photo to the left. There is currently no insulation to the roof.

The G13, 36 watt fluorescent tube lighting can be seen.

Figure 6 Main lighting and display lighting

The display lighting comprises mainly R63 11 watt CFL spots lights.

Figure 7 Meeting room lighting



Fluorescent lighting in the meeting room. This was the only lighting not on during the site visit.

Figure 8 Fluorescent 2D lamp lighting in the hall way by the meeting room

This lighting was also on during the visit. It is possible to replace these fluorescent 2D units with LED alternatives when they fail.

Figure 9 The only natural lighting in the main room comes from the open doors and two small windows near the roof.

This photo illustrates the lack of natural lighting and use of electric lighting in the building.

Figure 10 Ceiling area

There is no insulation on the ceiling. Panel insulation could provide a solution for mounting insulation to the roof area. This would reduce heat loss from the building envelope. Warm air would still rise into the high ceiling space though.

Energy Use

The building's current energy demand is from electric lighting, heating and appliances.

Heating is limited to three small plug in heaters.

The main electrical demand is currently from lighting, which is used for much of the time that the centre is open, even on bright sunny days.

Figure 11 Countryside centre energy use

Electrical Demand p/a kWh	CO^2 emissions kg	Cost – inc standing charge and VAT £	MPAN	Grid Connection
3154	1415	627.52	S03/801/110/22/ 0001/4223/229	Single phase

The Countryside Centre is on a standard business tariff and pays a unit charge of 13.56 pence per kWh and a standing charge of 25 pence a day.

The building's electrical demand goes up significantly during the peak summer months, when visitor numbers are highest. With no heating on during this time, and little in the way of major appliances, most of this demand will be from lighting.

Building Improvements.

Reducing heat loss from the building envelope would allow it to be heated more easily, creating a more pleasant environment in the colder months.

Cavity wall insulation is relatively straightforward to install and can be cost effective.

Insulated floor panels would reduce heat loss and could be included as part of the refurbishment. They would be the cheapest way of reducing heat loss through the floor of the building.

Reducing heat loss from the roof of the building could be achieved by using a suspended ceiling, spray on insulation or insulation panels. Each has different aesthetic results and cost implications. Panels fixed to the ceiling space with added insulation would be the most suitable solution for the main space in the building.

Utilising passive solar gain from the proposed extension to the building could create a warmer and more pleasant environment on cool but sunny days. Approximately 15-20% of a buildings heating will already come from solar energy through walls and windows. The use of passive solar design would seek to optimise this, and thus reduce reliance on active heating sources.

Some passive solar design incorporated into the new extension would look to maximise solar gain during the winter months and to reduce it during the warmer summer months. The amount of solar gain possible in the extension will depend upon the south and east facing glazing and the thermal mass designed into the build.

To take advantage of solar gain in the winter, the solar radiation is used to heat a large thermal mass (such as concrete) within the building, which absorbs this heat during the day and radiates it back into the building space during the cooler night. In the summer this is reversed, with sunlight prevented from heating the thermal mass during the day, and thus it helps to absorb the warmth in the room, keeping it cooler.

Velux type windows could also be added to the northern pitch of the main roof. This would increase natural lighting in the building and reduce the need for room and display lighting.

The effectiveness of any passive solar gain will depend on the amount of glazing orientated for solar radiation and the thermal mass included in the extension. It is certainly something to be mindful of when discussing design with architects.

By increasing insulation levels and maximising any potential solar gain the building ca be kept warmer, for less cost than would otherwise have been incurred.

Electrical System Improvements

The key thing to focus on to reduce costs from electrical demand is the lighting.

There is a significant amount of lighting in the building and due to the limited amount of glazing it is on for much of the time. Although fluorescent tubes and CFLs are used, the efficiency of the lighting system can still be improved through the use of LED (light emitting diode) technology. This lighting can often be retro fitted into existing light fittings and offers significant savings over fluorescent technology. For instance a 36W fluorescent tube can be replaced with a 20W LED tube, saving energy. The LED lights will also last much longer than the fluorescent equivalent.

With an efficiency saving of around 40% possible from LED replacement of fluorescent lighting, a significant carbon and cost saving can be made. The most sensible approach would be to replace the current fluorescent lighting with LED alternatives as they fail.

Renewable Generation

Solar PV

With much of the electrical demand for the building coming in the summer months a logical renewable technology for offsetting electrical costs would be roof mounted solar PV. The building has a suitable south facing roof space, thought there would be some shading of the roof in the low winter sun.

With a single phase grid connection the maximum that will be allowed is 16 amps per phase, so just under 4 kWp for the building. This equates to around 16 panels, depending on manufacturer and specification.

Wood Fuel Heating

There is currently no fixed space heating system for the centre. Any heating is provided by three small portable heaters. The centre is therefore closed in the colder months.

The options for installation of space heating are:

- Wall mounted electric heaters
- Wall mounted electric storage heaters – would require off peak electrical tariff to be cost effective
- Air source heat pump linked to low temperature radiator units – this would not be ideal. With the number of visitors to the building, a heat pump would struggle to provide cost effective heating with the large number of air changes the door opening and closing. There is also limited wall space for radiator units. Underfloor heating could be used but installation costs would be high.
- Wood fuel heating – wall mounted radiators or blown air units linked to a wood fuel boiler unit. This could utilise local wood fuel or delivered pellets.
- Connection to mains gas supply and installation of gas boiler unit.

The conventional electric heating systems would have a high carbon cost due to their consumption of mains electricity. Off peak heating using storage heaters could be cost effective, but may result in a cooler building towards the end of the day in the coolest weather.

Heat pumps (ground or air source) are not recommended for this building.

The most viable renewable heating system would be a wood fuel boiler. However to be cost effective a system would be best linked to the surf museum next door. This building has a larger heating demand and coupled with the countryside centre would provide sufficient heating demand for a wood fuel boiler unit, helping to offset the high capital costs.

The suitable wood fuel boiler options would be a log boiler, utilising local seasoned timber supplies, or a pellet boiler using delivered processed fuel.

A log batch boiler would require manual loading and a storage area for the seasoned timber. A pellet boiler would require less space footprint but would not utilise local timber supplies. Prices of fuel would depend on where the logs were sourced from. The costs of pellet fuel are roughly equivalent to that of mains gas (in the long term).

A log boiler could perhaps heat both the countryside centre and the surf museum and use local community woodland for timber, to keep costs low. Supply could be linked to local ‘logs for labour’ scheme, keeping supply costs down whilst covering the harvesting and storage of the timber.

Mains gas would provide cost effective heating of the premises but connection to the mains supply could be expensive. Enquiries as to this cost are being made.