Walton Community Hall

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Background and Energy Consumption

Groundwork East visited Walton Community Hall on 18th July to investigate ways to increase the energy efficiency and reduce the carbon footprint of the Hall. The report covers emissions from the Hall's own premises including electricity and water.

Energy consumption was provided which included electricity and water for a 12-month period so the carbon footprint could be calculated.

Estimated annual consumption based on the bill data provided;
Electricity: 18,450 kWh
Water Consumption: 31 m^3

Report Average Unit rates
Electricity (Day rate): £0.40/kWh

Carbon Footprint

GHG emissions are expressed as tonnes of CO_2 equivalents (tCO_2e). This is a unit of measurement used to indicate the global warming potential of a greenhouse gas, expressed in terms of the global warming potential of one unit of carbon dioxide.

Scope 1: These are Direct Emissions which arise from the activities of an organisation and include fuel combustion on site or in owned equipment, such as gas boilers, fleet vehicles and mobile machinery.

Scope 2: These are Indirect Emissions from electricity purchased and used by the organisation. Emissions are created during the production of the energy which is eventually used by the organisation.

Scope 3: These are all other Indirect Emissions from activities of the organisation, occurring from sources that they do not own or control, such as those arising from business travel on public transport by employees, the supply and sewerage of water at the business premises, and from the disposal of waste. Included here are emissions

arising from the 'Transmission and Distribution' (T&D) and Well to Tank (WTT) of electricity and Scope 1 fuels purchased by the organisation.

The Greenhouse gas emissions for the reported energy consumption is 4.8tCO_2e per year covering Scope 2 and 3.

Table 1: Breakdown of emissions

		2022/23
Scope 2	Electricity	3.6
Scope 3	Electricity T&D and WTT	1.3
	Water supply and treatment	<0.1
		4.8

The below recommended measures can help reduce the Hall's carbon footprint and save energy.

Table 2: Recommended GHG Emission Reduction Measures

Measure	Savings (kWh)	Annual Cost Savings	Savings (tCO_2e)	Estimated Cost (Excl. VAT)	Payback (years)
Lighting Upgrade	740	£295	0.2	£1,300	4.4
Solar PV	3,850	£1,540	1.0	£22,000	14.3
Battery	3,450	£1,380	0.9	£10,000	7.2
Heat Loss Reduction - Double Glazing	1,357	£543	0.4	£9,350	17.2
Electric Heating	8,000	£900	2.1		
	17,340	£4,635	4.6	£42,650	9.3

This represents around 95% savings of the total Greenhouse Gas Emissions.

The estimated payback on the recommended measures are linked to the resource £/kWh listed in the "Background and Energy Consumption" section. A higher price per kWh would result in a lower payback and vice versa.

Lighting Upgrades

The lighting is predominately halogen and compact fluorescent (CFL) fittings.

Upgrading to LED will offer improved energy consumption efficiency, estimated annual saving of 0.2tCO_2e and 740kWh. It is recommended that the lighting be upgraded to LEDs as and when these lamps require replacing.

Modern LED lighting also eliminates flicker and can improve light quality for users of the hall.

Savings and thus payback periods are fundamentally linked to the operational usage. Higher usage would mean greater energy savings and thus shorter payback periods.

Solar PV

There is roof space available which may be suitable for solar panels, subject to appropriate suitability checks.

The size of any array should be balanced with the demand in order to maximise the benefits, as the main benefits come from being able to use the electricity generated rather than exporting unused generation to the grid. A battery system would allow daytime generation to be used in the mornings, evenings and night, however the cost of a battery system can be as much as the solar panel array, so careful consideration as appropriate sizing is required.

It is generally estimated that at least 50% of the generated electricity could be used on site. This is typical for this building use type.

It is generally possible to reach an export agreement with an energy supplier whereby any exported electricity can be sold to them:
https://www.ofgem.gov.uk/environmental-and-social-schemes/smart-export-guarantee-seg

Table 3: Solar PV Calculations

	Array	Battery
Total system capacity (kWp)	11.2	Efficiency
Overall system output (kWh)	9,397	90%
Estimated usage of PV on site (%)	50%	
Avoided grid electricity (kWh per year)	4,650	4,250
% of grid electricity demand	25%	23%
tCO_2e savings per year	1.2	1.1

Total Project Estimated Cost (excl. VAT)	£16,000	£12,000
Estimated payback period (years)	8.6	7.1

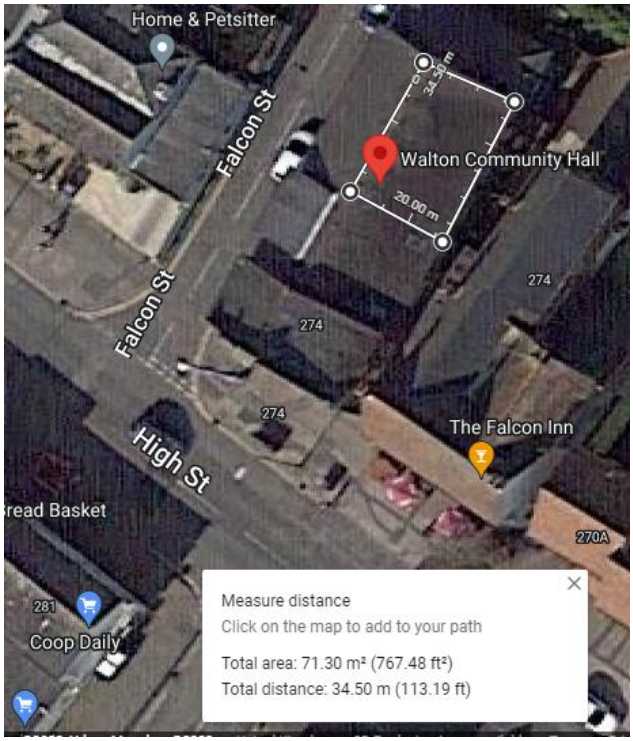

Figure 1: Aerial view of the proposed roof space

Thermal Improvements

The Hall has roof insulation to modern standards which was installed within the past few years.

The Hall also benefits from double glazing which makes up approximately half of the total glazing. Fitting double glazing could reduce the heat demand of the building. The below calculations assume the building remains used in its current state.

Table 4: Thermal improvements (Glazing)

Element	Surface Area of Component (m^2)	Estimated Existing U-Value (W/m^2k)	Action	Upgrade to U-Value (W/m^2k)	Estimated cost (Excl. Vat)	Estimated payback period (years)
Glazing	37	5.7	Double glazing	1.6	£9,350	22.1

Heating Energy Saved (kWh)	1,050
Annual Energy Cost Savings	£200
Annual Carbon Emissions Saving (tCO_2e)	0.3

Air to Air Heat Pump

The Hall has a Daikin Europe reverse cycle heat pump installed that is currently used to deliver air conditioning to the building which is said to be too costly to run. This model appears to also be able to deliver heating, therefore, it is recommended to see if the controls allow for heat to be delivered or to contact a heating engineer to see if the heating element has been disabled.

Modern Heat-pump technology is extremely efficient whereby typically around three kW of heat produced only requires a kW of electrical power input. This system performance is referred to as a Heat Pumps' Co-efficient of Performance (COP).

Heat pumps offer higher efficiencies than other heating systems as they extract heat from external sources, such as air, water or ground, this is then condensed and distributed internally by water radiators, underfloor pipes or blown air.

A heat pump system is estimated to result in the cost of heating the building to decrease by £900 (assuming the electricity off-peak rate is half that of the day rate), and it is estimated to reduce the carbon emissions associated with heating by 2.1tCO_2e. These savings assume that double glazing is fitted.

If the heat pump is unable to deliver heat after confirming with a heating engineer, a new heat pump is estimated to cost £10,000.

Table 5: Estimated savings of using the current air to air heat pump

Measure	Savings (kWh)	Annual Cost Savings	Savings (tCO_2e)	Estimated Cost (Excl. VAT)	Payback (years)
Air to Air Heat Pump	8,000	£900	2.1		

Energy Behaviour Changes

We recommend encouraging everyone to be mindful of their use of energy and water on site, such as turning off heaters, lights, taps, equipment etc when not in use, as well as reducing heat loss/gains through closing/opening windows and doors where appropriate. If these actions are applied across the site, it is estimated that there could be a 5% reduction in energy and water use.

There are lots of online resources that can be used and shared with the hall users to encourage water and energy efficiency, and links to some of these resources are below for reference.

Carbon Trust

Energy Saving Trust

Funding and Additional Support

https://www.eastsuffolk.gov.uk/assets/Business/UK-Shared-Prosperity-Fund-grants/East-Suffolk-Business-Move-to-Net-Zero-grant-scheme-guidance.pdf

Also, a list of the main environmental funding pots can be found at:
https://www.greensuffolk.org/green-communities/grants-and-funding-opportunities/
https://carboncharter.org/resources-grants-and-funding/