# Energy statement in support of planning application for Wolfson College for window replacement and the addition of heat pumps.

12 January 2021

Wolfson College is a 1960's building that comprises of glass and concrete facades. The glass is single glazed and the walls and roof are not insulated. The walls and slabs run from inside to out forming cold bridges.

The envelope performs very badly by modern standards and the buildings consume a lot of gas to heat them. As well as only being single glazed the window frames are failing and do not seal so further increasing the ventilation heat loss and discomfort of the residents. The window sliders are also stiff and difficult to open.

There is an ambition in the college, the government and society at large to reduce and stop the CO2 emissions from buildings that are contributing to climate change. There is also an ambition to maintain the heritage of significant buildings, such as the Wolfson Campus in its visual appearance. This application is for works intended to match those ambitions.

The two aspects of the works are to reduce the heat loss of the building and to provide the remaining heat required from electrically driven heat pumps. The electricity can be sourced from renewable supplies making the system net zero carbon.

The major source of heat loss are the windows. The works will replace these with multi-pane glazing within a thermally broken thin frame. The windows have been chosen to provide a thin glazing profile to match the existing original profiles. The glass used is CUIN glazing with a centre pane u-value of 0.6 and 0.4 W/m2K for the vertical and horizontal sliders respectively. These u-values are the lowest on the market and are a factor of 10 less than the current single glazing u-value of 5.6 W/m2K.

The reveals around the windows will be insulated as shown on the architect's details to reduce cold bridging that would otherwise be a significant heat loss and a point of condensation. The windows will be significantly better sealed and trickle vents will be added around the edge to comply with building regulations. The rooms generally have extract fans in the kitchen and bathrooms to provide background ventilation.

Finally the roof will be insulated to modern standards further reducing the overall heat loss of the building.

The windows slide to open to provide a large free area for summertime cooling. In addition all the accommodation rooms are dual aspect and can get a through breeze.

The heating currently is with gas fired boilers. These will be replaced with air-source heat pumps that make use of external air to provide heat for the building. Reducing the heat loss significantly will minimise the amount of heat pump power required to 600 kW of heat. The heat pumps will be sited inside the carpark on the lower ground floors that are well ventilated with external air through the vertical steel bars. The external façade of the building will not be affected. The heatpumps will connect into the existing heating system in the plant room. Holes will be made in the blockwork between the carpark and the boiler room to accommodate the pipes and wires.

The hot water system is also served from the boilers in the boiler room. There is extensive pipework to some 7 plate heat exchangers around the building to provide instantaneous hot water. This system is energy intensive and looses a lot of heat in the pipework. This is due to replaced with several small air-source heat pumps sited locally to the building block to reduce the runs of hot water pipework.

The electrification of the heat will require a larger electricity supply and the application also includes a second substation on the site.

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The building was modelled on a version of the Passivhaus PHPP model to set out the effects of the changes to the glazing and insulation. The heating and hot water losses where modelled separately. The results of the changes where entered into the government sponsored Salix spreadsheet that changed the energy figures into carbon reductions.

The table of these figures are shown below:

| | Tons/year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Main campus current carbon foot print: | 1,400 | | Including Robin Gandy, M block and CM building | | | | | | |
| Savings due to interventions: | | | Percentage of total saving | Saving on the energy of the component | | | | | |
| Windows | -333 | | 38% | 50% | Saving to current heat loss | | | | |
| Window surrounds | -147 | | 17% | 44% | Saving to remaining heat loss | | | | |
| Roofs | -72 | | 8% | 40% | Saving to remaining heat loss | | | | |
| Heat pump | -100 | | 11% | 43% | Saving due to using heat pump to meet remaining heat loss | | | | |
| HWS heat pump and pipe changes | -200 | | 23% | 80% | Changes to pipe work and using heat pumps | | | | |
| LED lighting | -24 | | 3% | 72% | Changes from current lighting. | | | | |
| Total saving | -876 | 63% | Reduction in carbon emissions | | | | | | |
| Post project carbon emissions of the main campus | 524 | | | | | | | | |
| Note: | | | | | | | | | |
| No works being done to Robin Gandy | | | | | | | | | |
| Only work to hot water in blocks M and CM. | | | | | | | | | |

The result of the interventions will be a building that can be made net zero carbon by using zero carbon electricity and significantly more comfortable to live in.