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Energy and Sustainability Statement

Solar thermal and solar PVT installation at the British Library

A. Mellor, 23 August 2021

The proposed solar thermal and solar PVT installation at the British Library will generate solar heat and power for the building, displacing consumption of natural gas and mains electricity, and so reducing the building's local emissions and overall carbon footprint. The proposed array will consist of both VirtuPVT collectors (electrical and thermal output), and VirtuHOT collectors (thermal output). Following analysis of the annual heat and power demands, and the available space on the level 4 roof, an array consisting of 240 VirtuPVT collectors and 710 VirtuHOT collectors has been proposed. The proposed array has a larger number of thermal only collectors (VirtuHOT) as compared to combined electrical and thermal collectors (VirtuPVT) to maximise the total carbon saving, whilst providing both heat and electricity provision. Plans of the proposed array are submitted separately with this application.

Solar thermal contribution

Both the solar thermal and solar PVT collectors will generate solar heat to be fed into the building's low temperature heating and domestic hot water (DHW) systems, reducing the amount of natural gas burned in the building's on-site boilers.

The solar thermal and PVT array and system has been designed to fulfil the expectations of solar thermal systems stated in Camden's Planning Guidance on Energy Efficiency and Adaptation. In particular

- The system has been sized to meet nearly 100% of the low temperature heating demand in April, May and June. Any excess heat will be fed into the DHW system. Space constraints mean that 100% of summer DHW demand cannot be met.
- The total gross area of the proposed solar thermal array is given in the table below. Note that both the solar thermal and the solar PVT collectors constitute the solar thermal array.

	No. of collectors	Gross area installed (m^2)
Solar thermal	710	461.5
Solar PVT	240	156
Total	**950**	**617.5**

- the interface between the solar water system and existing boiler heating system is via a heat exchanger set up in parallel to the current boiler system heat exchanger to replicate the current boiler control system. In addition, a 15 m^3 buffer vessel has been installed to handle peaks in demand and maximise the solar heating benefit.
- The system is a central system
- A heat meter will be installed to accurately measure heat provided by the solar water system.

PV contribution

The solar PVT collectors will generate PV electricity, reducing the consumption of grid electricity. Following a comparison of the predicted generation from the PVT array with the known electrical consumption of the building, 100% of the PV electricity generated will be used on site; 0% will be exported to grid.

The PVT array and system has been designed to fulfil the expectations of PV arrays stated in Camden's Planning Guidance on Energy Efficiency and Adaptation. In particular

- The PVT collectors will be installed flat to roof, and raised above the roof to produce a level array to accommodate support frames, and to accommodate and conceal cabling and pipework for minimal visual intrusion.
- A total of 240 PVT collectors will be installed with a total gross area of 156 m^2, and a peak capacity of 17 kWp.
- A meter will be installed to monitor and record electrical power generated by the PVT collectors.
- There are no birds nesting or bats nesting in this area of the roof currently.
- Safe access for maintenance has been incorporated in the panel design, all panels are at least 1 m from the building parapet and with designated access walkways to facilitate maintenance.

Total energy and CO_2 savings

Both types of energy savings (thermal and electrical) produce CO_2 savings. The total CO_2 saving is predicted to be 70,527 kg CO_2 per year. This number has been calculated by performing a year-round simulation of the energy generation by the solar installation, and applying the SAP 10.1 carbon emission factors of natural gas and UK mainland grid electricity. A breakdown of the prediction is given in the table below. This analysis has been performed by Naked Energy Ltd.

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Annual Solar Generation

thermal (kWh/year)	261,278	*Calculated using Scenocalc calculation tool*
AC electrical (kWh/year)	14,273	*Calculated using Scenocalc calculation tool*

Annual Energy saving

Gas saving (kWh/year)	326,598	*assumes gas boiler is 80% efficient*
Electricity saving (kWh/year)	14,273	

Annual CO_2 saving

CO_2 intensity mains gas (kg / kWh)	0.21	*SAP 10.1*
CO_2 intensity electricity (kg / kWh)	0.136	*SAP 10.1*
CO_2 saving natural gas (kg / year)	68,586	
CO_2 saving electricity (kg / year)	1,941	
Total CO_2 saving (kg / year)	**70,527**	